The Sources of Economic Growth in the New Zealand Economy after 1950

by

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Abstract

This thesis examines the New Zealand economy over the period since the second World War, and attempts to establish what factors were important in determining the overall rate of growth of the economy. This is a matter of some concern, both to the public and Government of New Zealand. Discontent has been expressed at times with the fact that, although the standard of living in New Zealand is very high, the measured rate of growth of G.D.P. per capita has been lower than in any of the other high-per-capita income countries except the United States and the United Kingdom.

Various reasons have been suggested for this apparently-low rate of growth of labour productivity, and in particular the quantitative import restriction system has been credited with a large proportion of the responsibility for what is considered to be a poor performance. Quantitative import restrictions were introduced in 1938 in response to a rapidly-deteriorating balance of payments position, and while the initial motive for their introduction was to improve the foreign payments position, it soon became apparent that the protective effect of quotas was very important indeed. A large number of industries grew up under this protection, a high proportion of the new entrants to the labour force became employed in manufacturing, and industrial output grew rapidly. The Agricultural sector, which produces virtually all of New Zealand's foreign earnings, steadily lost labour and expanded output, experiencing a steady but, in international comparison, rather low rate of growth of labour productivity. While studies have been made of productivity growth in Agriculture and in certain manufacturing industries, to date no comprehensive study has been published on the overall growth of the economy over a long period.

In deciding to undertake such a study, it was considered that the investigation should have two main characteristics. Firstly, in view of the fact that structural change has been taking place quite rapidly in the economy under the impetus of import controls, the study should not content itself with examining growth in the aggregate, after the fashion of Denison, but rather should examine at a sectoral level the growth that has taken place. Accordingly twelve sectors, which together comprise the whole of the economy, are distinguished in this thesis, and for each the rate of growth of output, employment, and labour productivity is examined.

Secondly, it was felt that the study ought to be comparative, and so accordingly the performance of each sector is examined in comparison with the performance of its counterpart in each of the major O.E.C.D. countries.

In order to carry out a study of this sort it is necessary to examine a large quantity of data. For O.E.C.D. countries this is for the most part readily available. For New Zealand, however, the availability of data is uneven. In general, information on prices, wages, and all aspects of employment is comprehensive and accurate, reflecting New Zealand's historic concern with social welfare. Information on the volume of production is also reasonable for the goods-producing sectors of the economy, following the publication of sectoral indexes of production by the Government in 1962 for the post-war period from 1954/55 onwards. Information on capital formation in constant prices is, however, very limited.

A study of this data for the goods-producing sectors of the economy leads to the following conclusions. The growth of output and employment in industry was relatively rapid in international comparison, but a lower proportion of industrial output was devoted to capital formation

than in most countries, and presumably as a consequence of this the rate of growth of labour productivity was lower than in the majority of countries. There is no evidence that, having regard to the level of investment in industry, the rate of growth of output per man was particularly low, however, so that if the relatively low rate of growth of labour productivity in industry is to be attributed to the operation of import controls, the mechanism must be that import restrictions have caused investment to have been lower than would have been the case had import controls not operated.

In Agriculture, the rate of growth of output per man was also low in international comparison, and because this sector is relatively large in New Zealand it played an important part in determining the overall rate of growth of productivity. Labour productivity is higher in the New Zealand agricultural sector than in Agriculture anywhere else in the world, so that productivity growth is much more a matter of developing and applying new techniques than it is in European countries, where output per man can be expanded considerably within the confines of existing technology. In other major sectors, notably construction, Public Utilities, transport, communication, and wholesale and retail trade, the New Zealand productivity performance was found to be broadly satisfactory in international comparison.

Official data for the service sectors of the economy, however, which produce nearly half of total G.D.P., is greatly lacking in New Zealand. Only one official index of production is produced, for the sector as a whole. In order to overcome this lack of information, it was decided to compile output indexes for all of the service sectors that are customarily distinguished in publications of O.E.C.D. countries, using similar indicators to those used in the O.E.C.D. countries. In carrying out this task, considerable use was made of data produced by Gillion and Frankel of the New Zealand Institute of Economic Research. This data,

which was produced for the period 1954/55 to 1965/66 under a special grant, was published just as work on this thesis commenced, and so a unique opportunity was presented to study data that had not previously been available, and which is considerably more detailed than any that is likely to be published in the forseeable future for subsequent periods.

It was found that it is possible to compile an index of total service sector output that grows at the same rate as the official index only if it is assumed that in most of the activities within the service sector of the economy the rate of growth of output is no more rapid than the rate of growth of employment. It is demonstrated that most O.E.C.D. countries assume that labour productivity in fact grows at a positive rate in the service sector, and often the assumption is made that this rate is quite high - Germany, for example, assumes that the rate is very nearly as high as in industry.

Given that this attribution of productivity growth is arbitrary, it follows that in O.E.C.D. countries the measured rate of growth of G.D.P. per person employed is biased upwards in relation to the New Zealand value, or, conversely, that the conventions adopted by the New Zealand Government Statistician underestimate the rate of growth of the New Zealand economy relative to the growth of other countries.

Given further that there is no strong evidence that import controls caused inefficient growth in the goods-producing sectors in New ZEaland, the major conclusions of this thesis are that New Zealand's relative growth performance has been better than a comparison of published data would suggest, and that any remaining tendency for the growth of output per person engaged to be relatively low has been caused in large part by the relatively large size of the Agriculture sector which, given its highly advanced state, has performed creditably in increasing output per man steadily throughout the period.

In addition to this broad sectoral study, a detailed examination is made of the structure of industrial growth in New Zealand at the 2-digit level of disaggregation, and a comparison is made with the structure of industrial growth in Denmark, Norway, Canada, South Africa, Finland, the United Kingdom, the United States, and Australia.

Chapter 1

The purpose of this thesis is to examine why the New Zealand economy grew in the way it did, and at the rate it did, over the period since the second World War.

The New Zealand economy is characterised by a number of features which make it an interesting subject of study. In the first place, New Zealand is one of the very few countries to enjoy a high standard of living that is based in large part on agriculture. That the standard of living is relatively high in New Zealand can be seen from the data in Table 1-1, which shows the value of national income per capita, converted into U.S. dollars at prevailing exchange rates, for the high-per-capita income countries.

New Zealand ranked fourth highest in terms of national income per capita in 1952-54, only Canada, the United States and Switzerland having higher levels. By 1965, New Zealand still occupied a high place in the international 'league' table, having dropped just two places to sixth, having been overtaken by Denmark and Sweden. Over the same period New Zealand's nearest neighbour, Australia, fell in rank from fifth equal to seventh, although 1965 marked a considerable narrowing of the standard of living gap that had previously existed between the two countries.

Between 1965 and 1970 New Zealand's relative position declined considerably: New Zealand ranked twelfth in 1970, having been overtaken by the Netherlands, Belgium, Denmark, Norway, France, West Germany and Australia. The magnitude of the overall post-war decline in New Zealand's relative position is not quite so severe, however, as this comparison of the rankings might suggest, because over the period being examined the

Table 1-1	G.D.P. per capita, U.S. dollars[1], high-per-capita income countries (ranked 52-54)		
Country	1952-54	1965	1970
U.S.A.	1870	3240	4734
Canada	1310	2156	3676
Switzerland	1010	2128	3135
New Zealand	1000	1867[2]	2188[2]
Sweden	950	2248	4055
Australia	950	1840[3]	3091[4]
Belgium	800	1583	2633
United Kingdom	780	1579	2128
Denmark	750	2070	3141
Norway	740	1712	2944
France	740	1626	2901
West Germany	510	1659	3034
Netherlands	500	1394	2353
Austria	370	1110	1937
Italy	310	974	1727
Japan	190	803	1911

(1) Converted from values in domestic currency using prevailing exchange rates.

(2) 12 months beginning 1st April of year stated

(3) Figure not adjusted to the U.N. Systems of National Accounts.

(4) Calculated from G.D.P. and Exchange rate data in I.M.F. International Financial Statistics, October 1972 and population data in U.N. Monthly Bulletin of Statistics (99)

Sources: "Per Capita product of 55 countries 1952-54", U.N. (100)
U.N. Statistical Yearbook (101).

dispersion of the levels of national income per head in the various countries has narrowed considerably. For example, in 1949 the country which ranked 12th (France) had a level of national income per capita that was only 0.33 times as large as that of the top country (the U.S.). By 1965, the value of per-capita national income in the 12th country (Belgium) was 0.49 times as large as the value in the top country (the U.S.), similar to the situation in 1970, when the value of national income per capita in the 12th country (New Zealand) was 0.47 times the value in the top country (again the U.S.).

This high initial ranking and slow relative decline of New Zealand in terms of national income per capita is consistent with the evidence of various indicators of social welfare, although these indicators suggest that the relative decline in social welfare has been less marked than the relative decline in national income per head. In a comparative study of 20 countries and 17 social indicators[1] King (45) found that under a scoring system in which equal weight is attached to each of the 17 indicators, New Zealand in 1951 had the third highest level of social welfare of any country in the world, the New Zealand 'score' being exceeded only by the United States and Canada. By 1969, New Zealand's relative position had declined a little, to 6th place, having been overtaken by Sweden and Norway.

That the New Zealand economy is based to a relatively large extent on Agriculture can be seen from the data in Table 1-2 below, which shows the proportion of Gross Domestic Product originating in Agriculture in each of the countries examined in Table 1-1, excepting Sweden, appropriate data for which is not available from international sources. The table

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(1) These indicators are : Radio receivers per 100 head of population, Telephones per 1000 head of population, motor accident death rate, suicide rate, stomach ulcer death rate, late foetal death rate, infant mortality rate, protein consumption per person per day, doctors per 10,000 head of population, hospital beds per 1,000 head of population, percentage of females in the student population, number of students per 100,000 head of population, percentage of G.N.P. expended on public education, illegitimacy rate, dependency ratio, population density, gross reproduction rate.

Table 1-2 Proportion of Gross Domestic Product originating within Agriculture, various countries

Country	Year 1950	1965	1969
Italy	0.29	0.15	0.14
New Zealand	0.25	0.13	0.10
Denmark	0.21	0.12	0.09 (2)
Australia	0.19 (1)	0.11	0.08
Austria	0.18	0.10	0.07
France	0.15	0.09	0.07
Norway	0.15	0.08	0.06
Netherlands	0.14	0.08	0.06
Canada	0.13	0.07	0.05
Sweden	N.A.	0.07	0.05
West Germany	0.11	0.06	0.04
Belgium	0.09	0.05	0.04
United States	0.07	0.03	0.03
United Kingdom	0.06	0.03	0.03

Sources:

New Zealand: Data on G.D.P by sector of origin is not available for New Zealand from national sources. The 1950 value given in this table is an estimate derived by back-extrapolation from 1965 and 1954 values given in Appendix Table 7-3 to Chapter 7. The 1965 value is obtained from input-output data collected and published by Gillion and Frankel (23). The 1969 is an estimate made by the author from data on employment shares and the movement of relative prices, and hence must be regarded as approximate only.

All other countries: U.N. Statistical Yearbook (101), various issues.

(1) 1953

(2) 1968

shows that in 1950 New Zealand had the second-highest dependence on Agriculture of any of the countries, and this dependence did not reduce greatly over the period. This is in marked contrast to most of the other countries, where the decline in the relative importance of Agriculture has been quite marked. In Australia, for example, Agriculture in 1968 produced only 9% of total G.D.P., compared with 19% in 1953, and in Italy the proportion fell over the same period from 29% to 10%. The only other country which, like New Zealand, has a heavy dependence of Agriculture and which figures prominently in world trade is Denmark, and in this country too Agriculture has declined considerably in relative importance. In 1950 Agriculture in Denmark produced 21% of total G.D.P., but by 1969 the value was only 8%.

The second important characteristic of the New Zealand economy is that it is extremely remote. New Zealand is 1200 miles away from Australia, its nearest neighbour of any size, and is 13,000 miles away by sea from Britain and the major sea ports of Europe. This remoteness does not place New Zealand at any particular relative disadvantage where the export of primary commodities is concerned, because its major competitors are Australia and various South American countries, all of which are also a considerable distance from the major markets for their exports. But where the export of manufactured goods is concerned, New Zealand's remoteness does place it at a disadvantage relative to all the major industrial countries other than Japan, because all these countries are much closer to the major markets than is New Zealand. This is likely to be one of the reasons why New Zealand has to date exported relatively few manufactured goods, although undoubtedly there were also other important reasons, which are examined below.

Not only is New Zealand remote relative to other countries, but the degree of remoteness of its economy, as indicated by the movement of ocean freight rates relative to export and import prices, did not change greatly over the period. This can be seen from the data in Table 1-3 and from Chart 1-1 below. Over the period 1952 to 1969, Freight rates[1] showed a slight overall decline, from an index value of 145 in 1952 to a value of 131 in 1969[2], a mean annual rate of decline of 0.6%. Over the same period export prices increased at an annual rate of 1.0% and import prices at 1.4%. This comparison is not, however, an accurate representation of the long-run trend movement of ocean freight rates relative to export and import prices. In the early 1950's ocean freight rates were still abnormally high, this being due to the large Korean-war increase in demand for tramp shipping, whereas New Zealand's export prices had already reverted to relatively normal levels. Furthermore, freight rates rose to a new sharp peak in 1956, caused by the Suez war.

Thereafter, freight rates were considerably less volatile, growing comparatively steadily from an index value of 81 in 1958 to 131 in 1969, an average annual rate of growth of 4.4%. Over this same period import prices grew at an average annual rate of 2.2%, and export prices at 2.1%, so that over this more stable period the extent of New Zealand's economic remoteness as measured in this way was slowly increasing.

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(1) This is a general index, and relates to dry cargo. The index is compiled by the United Nations from individual freight rates for a fixed class of goods on fixed routes: these rates are averaged using as weights the volume of goods on that route during the period. While this index is representative of routes in addition to those between New Zealand and its major trading partners, the variability in the trend rates of growth of freight rates on different routes is comparatively small, so that this index is broadly representative of the rates faced by New Zealand. Furthermore this series has the advantage that it is of high quality, and covers a long period. A detailed description of the series is given in the 1967 Supplement to the U.N. Statistical Yearbook (101) and the Monthly Bulletin of Statistics (99).

(2) See Table 1-3, Column 1.

Table 1-3 Indexes of ocean freight rates, and New Zealand export and import prices, 1956 to 1969.

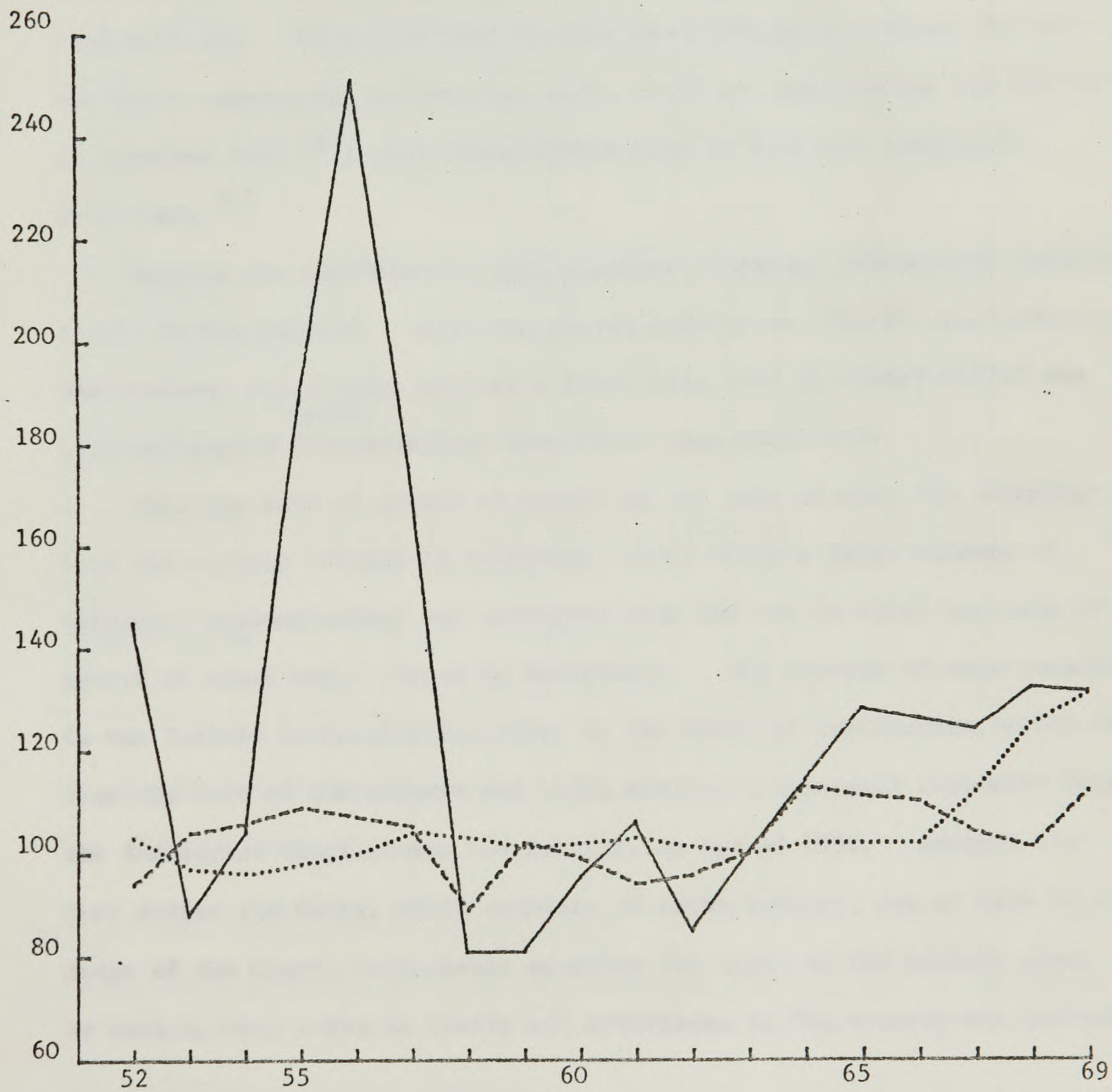
Year	Index of U.K. Time Charter Freight rates, 1963=100	Index of New Zealand Export prices, 1963=100	Index of New Zealand Import prices, 1963=100
1952	145	94	103
1953	88	104	97
1954	104	106	96
1955	188	109	98
1956	251	107	100
1957	176	105	104
1958	81	89	103
1959	81	102	101
1960	95	99	102
1961	106	94	103
1962	85	96 (1)	101 (1)
1963	100	100	100
1964	114	113	102
1965	128	111	102
1966	126	110	102
1967	124	104	112
1968	132	101	125
1969	131	112	131

Sources: Time Charter freight rates: U.N. Monthly Bulletin (99), various issues.

Export and import prices: 1971 New Zealand Yearbook (67), pages 696 and 698.

(1) Prior to 1963 data was published on a calendar-year basis. From 1963 data is on a June-year basis.

Chart 1-1 Indexes of New Zealand import prices, export prices, and freight rates.



Sources of data: See Table 1-3

In New Zealand the maintenance of full employment has for many years been a very important policy goal[1] and it has been achieved with spectacular success. From 1948 to 1955 the monthly average of the number of registered unemployed was always less than 100[2]: thereafter the unemployment rate rose, reaching a one-month peak in July 1959 of 1,656 out of a workforce of 861.8 thousand, an unemployment rate of 0.19%. From July 1959 onwards unemployment decreased, and did not reach substantial proportions again until the devaluation and deflation of November 1967.[3] A peak unemployment rate of 0.8% was reached in July 1968.[4]

Despite the continuously high pressure of demand prices rose relatively slowly in New Zealand. Over the period 1954/55 to 1966/67, for example, the consumer price index rose at a lower rate than in almost all of the high-per-capita income industrialised countries - see Table 1-4.

This low rate of growth of prices in the face of very low unemployment was secured largely by consensus, there being a large measure of agreement between unions and employers over the way in which the rate of growth of money wages should be determined. The process of wage-bargaining in New Zealand is institutionalised in the Court of Arbitration, which dates from the turn of the century and which derives its present authority from the Industrial Conciliation and Arbitration Act of 1954. Amongst its many duties the Court, which consists of three members, one of whom is a Judge of the Court, establishes annually the level of the minimum wage. By custom, wage rates in nearly all activities in the economy are increased

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(1) See W.B. Sutch (91), especially the chapter "Depression between the wars".

(2) This value, and the subsequent values for the unemployment rate, refer to registered unemployment. The number of unemployed as indicated by periodic census returns is somewhat higher, because census figures include those temporarily stopped and also those who are between jobs.

(3) For a discussion of the events leading up to devaluation, see G.N. Zanetti (107).

(4) The conjunctural events of 1967/68 have been described in detail by B.D. Shaw (88), and K.D.S. Jones (40) has described the events of

Table 1-4 Rate of growth of consumer prices, high-per-capita income countries, 1955 to 1967

Country	Rate of growth of Consumer prices % per year
Denmark(2)	5.0
France	4.4
Sweden	4.0
Japan	3.9
Norway	3.5
Italy	3.3
Netherlands	3.3
United Kingdom	3.1
Austria(1)	3.1
New Zealand	3.1
Australia	2.5
West Germany	2.4
Belgium	2.4
Canada	2.1
United States	1.8

(1) Vienna only, excluding rent

(2) 1958 to 1967

Source: U.N. Statistical Yearbook (101)

each year by the same proportion as the increase in the minimum wage - the close association between the change in average wage rates and the change in the Minimum Award Rate has been demonstrated by Brownlie (5) in an econometric equation in which the Minimum Award Rate was found to be a statistically-significant variable in the explanation of the general level of wages. After the devaluation in 1967, however, when a certain amount of deflation occurred together with a steep rise in import prices, this high degree of consensus broke down and a certain number of aggressive unions spearheaded increases in basic wages which were large in historic comparison.

It is not possible to be certain why it was that during the 1950's and much of the 1960's unions and management were able to agree on a wages policy that ensured that the excess of the rate of growth of wages over the overall rate of growth of productivity was small, but two reasons can be suggested. The first concerns the attitude of workers and trade unions to the rate of growth of real consumption. Turner and Wilkinson (93) have suggested[1] that in Britain the cause of the post-1967 wage explosion was the slowdown in the growth of real net earnings, brought about by devaluation, increased taxation, and other increasing state deductions from wages. Such an argument could also apply to the New Zealand experience, at least after 1966.

As the data in Table 1-5 shows, real earnings grew fairly smoothly[2] in New Zealand up to 1967. In 1967 the Consumer Price Index rose rapidly, due largely to the increasing price of imported goods following the devaluation of the New Zealand dollar by 19.5% relative to the U.S. dollar, and wages rose only slightly, because of a virtual wage freeze

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(1) This argument is also supported (again for Britain) by Meade (53).

(2) This data refers to Manufacturing, and was selected partly because this data is relatively reliable, and partly because in New Zealand, as in other countries, this sector is relatively important in setting the overall pace of wage growth in the economy.

Table 1-5 Real earnings in New Zealand Industry

Year	Index of earnings, New Zealand Manufacturing, Base 1963=1.000	Consumer Price Index, Base 1963=1.000	Index of Real earnings, Base 1963=1.000
1949	.456	.573	.796
1950	.508	.616	.825
1951	.562	.688	.817
1952	.593	.728	.815
1953	.639	.763	.837
1954	.693	.794	.873
1955	.738	.812	.909
1956	.765	.842	.909
1957	.796	.860	.926
1958	.822	.906	.907
1959	.856	.927	.923
1960	.898	.936	.959
1961	.931	.956	.974
1962	.959	.979	.980
1963	1.000	1.000	1.000
1964	1.054	1.039	1.014
1965	1.103	1.070	1.031
1966	1.161	1.104	1.052
1967	1.187	1.172	1.013
1968	1.245	1.224	1.017
	(1)	(2)	(3)

Sources: Column (1) : Wages and Salaries in manufacuring ÷ total number of employees : 1971 New Zealand Year Book page 1061, converted to base 1963=1.000

(2) 1971 New Zealand Year Book, page 701, converted to base 1963=1.000

(3) Column (1) ÷ Column (2)

imposed by the Court of Arbitration. Thereafter substantial pay demands were made and granted, resulting in considerable domestic inflation, which has been described in detail by Holmes (33).

This "earnings-frustration" argument is not, however, a completely convincing explanation of the relatively low rate of growth of wages that obtained in New Zealand up to 1967, because there were two other occasions on which real earnings fell, albeit by smaller proportionate amounts. In 1951, real earnings fell by 1.0%, and in 1958 by 2.1%, and in neither case did dramatic wage inflation result.

A possibly more convincing reason why, up to 1967, the excess of the rate of growth of wages over the rate of growth of productivity was low in New Zealand may lie in a theory advanced by Streeten (90) and by Kaldor (43), which was later embraced by Jackson, Turner and Wilkinson (38). This theory takes as datum the fact that, at least in all the industrial sectors of each country, the variance in the rate of growth of wages is small in relation to the variance in productivity growth rates[1], and argues that this rate is determined in large part by the rate of growth of productivity in the industries in which productivity is growing fastest. These industries, if they are not to earn rapidly-increasing profits, a phenomenon which unions would resist, have either to cut price or accede to relatively large wage demands.

The Streeten-Kaldor argument is that the unions concerned will certainly prefer wage increases to a price cut, because they consume many goods other than those which they produce, and that management may well agree to increasing wages by a proportionate amount approaching the amount of productivity growth rather than face strikes and other symptoms of unrest in their industry. The observed historical fact of

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(1) This is true also of New Zealand.

near-constancy in differentials then requires that this rate of wage increase be met by all the other sectors, which have lower productivity growth and hence have to raise prices.

In a cross-country test of this hypothesis, Eatwell, Llewellyn and Tarling (16) found evidence that was consistent with this hypothesis: there was a reasonably strong tendency for the rate of growth of manufacturing earnings to be most rapid in those countries where the industries having most rapid productivity growth had a relatively high rate of productivity growth. The degree of statistical 'explanation' afforded by this hypothesis was greater than that afforded by the naive hypothesis that in Manufacturing in each country the average rate of growth of earnings is determined by the average of the rates of growth of productivity. This can be seen from the data in Table 1-6 and from the summary regression equations underneath.

The significant feature of New Zealand is that it had the lowest rate of growth of manufacturing earnings of any country except the U.S., and the lowest rate of growth of productivity in its 'top' industries of any country except Canada.

Furthermore, the excess of the rate of growth of productivity in the 'top' industries over the average rate of growth of productivity was lower than in any country except the U.S., Belgium and Canada, so that according to the Kaldor/Streeten theory less upward pressure on manufacturing prices would have been generated in New Zealand than in any country except these three.

However, while New Zealand experience of relatively slow price inflation is consistent with the Streeten-Kaldor theory, this theory would not explain satisfactorily the aceeleration in wages and prices after 1967, for there was no dramatic increase in productivity in the top three industries: to account for the post-1967 behaviour the Turner-Wilkinson theory would seem to be the more appropriate hypothesis.

Table 1-6 Average rates of growth of manufacturing earnings and of productivity, and productivity growth in "top" industries, 15 countries, 1958-1967

Country	Average rate of growth of manufacturing earnings $\bar{w}$	Average rate of growth of manufacturing productivity $\bar{p}$	Average rate of growth of productivity in the "top" manufacturing industries (1) z_3
Japan	9.88	9.08	11.86
Israel	9.48	4.71	10.54
West Germany	8.86	4.54	10.64
Denmark	8.64	4.31	10.37
Sweden	8.10	5.53	10.08
Finland	7.46	4.80	8.60
Ireland	7.22	3.88	6.76
France	6.83	4.16	8.14
Norway	6.79	3.74	7.67
Belgium	6.36	4.34	6.20
United Kingdom	6.11	2.93	6.65
Canada	4.14	2.72	4.93
New Zealand	3.84	3.32	5.93
U.S.A.	3.18	3.61	6.04

Summary regressions:

$$\bar{w} = \underset{(1.0)}{-0.1} + \underset{(0.11)}{0.83}Z_3 \qquad R^2 = 0.830$$

$$\bar{w} = \underset{(1.3)}{2.9} + \underset{(0.28)}{0.92}\,\bar{p} \qquad R^2 = 0.466$$

(1) the "top" industries are the three 2-digit industries having the most rapid rate of productivity growth.

Source: Eatwell Llewellyn and Tarling (16)

A further factor contributing to the low overall rate of growth of prices was the fact that up until the devaluation of 1967, import prices grew slowly, so that 'imported' inflation, which is a potentially important phenomenon in a country with a high ratio of imports to national income, was in fact not a matter of great consequence.

The fifth interesting characteristic of the New Zealand economy is that it is the only high-per-capita-income country to have applied quantitative restrictions to its imports continuously since the second World War. In addition to the various protective effects of quantitative restrictions on imports, which are examined in Chapter 2, import restriction by means of a quota has one effect that cannot easily be achieved by other forms of import selection, such as a tariff. By means of import quotas it is possible to regulate precisely the volume of imports, so that fiscal policy is left with the relatively simple task of maintaining employment at the desired level. This is a much more straightforward task than that faced by such countries as the U.K., where over the 1950's and 1960's the emergence of balance of payments crises, when coupled with a refusal in most instances to use any specific instrument such as devaluation to secure external balance, meant that fiscal policy and monetary policy together had to operate to produce a compromise position for both internal and external balance[1]. This was seldom accomplished with precision, because the relationship of both imports and exports to the level of aggregate demand is far from stable. One important consequence of the relatively high level of internal demand in New Zealand may have been, as has already been argued above, that wages and hence prices grew more slowly than would have been the case had the British "Stop-go" pattern of demand deflation and reflation been followed in New Zealand. Offsetting this possible

(1) A theoretical discussion of this problem has been presented by T.W. Swan (92) and W.M. Corden (7).

advantage of the particular operation of the quantitative restriction system, however, is the fact that quantitative controls, like any form of protection, cause internal relative prices to diverge from world relative prices. It has been argued frequently in New Zealand that the consequences of this distortion have been particularly severe: this view is typified by the following quotation from D.L. Gadiel (22) :

> "This policy (of quantitative restriction of imports) has led to an extremely inefficient allocation of resources, a telling commentary on which is the fact that during the decade 1954-55 to 1964-65 New Zealand's annual productivity growth of 2.08% was considerably behind growth rates achieved in the majority of areas enjoying similar living standards. It cannot be said that New Zealand devotes too small a proportion of its resources to capital formation: it seems rather to be a question of low marginal productivity of capital because price distortions have inhibited true growth industries."

This a widely-held view, and if it is correct it is a serious indictment of the whole of the post-war management of the New Zealand economy.

One of the primary purposes of this thesis is to examine whether this view is supportable by the evidence available. Certainly, the rate of growth of real G.D.P. per person engaged has been relatively low in New Zealand, the rate of 2.2% per year having[1] been exceeded by all major countries other than the United Kingdom. But the argument that this is due wholly, or even in large part, to the operation of quantitative restriction of imports needs to be investigated with care.

In order to carry out an investigation of this sort, it is almost certainly more fruitful to examine the growth of the economy sector by sector, rather than to adopt the single-sector approach of Solow (89),

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(1) Taken from data in Table 7-2 of Chapter 7.

Madison (50), Denison (15), and Jorgensen and Griliches (41), for as will be seen one of the major consequences of the quantitative import system has been to bring about structural change in the economy. The study of an economy on a disaggregated basis - 12 sectors are distinguished in this thesis - necessarily calls for the analysis of much more data than if the economy is studied in the aggregate, and this data has had to be drawn from a number of different sources.

Industrial data is readily available from official Government sources, but for Agriculture insufficient data is available from official publications, and considerable reference is made in this thesis to various publications of the Lincoln College Agricultural Economics Research Unit. This data is extremely detailed, and has permitted an examination of the change in the cost structure of Agriculture which probably would not be possible in any country except the United States, where the much more diverse nature of Agriculture would render the exercise less worthwhile.

As far as the goods-producing sector of the economy are concerned therefore (new I.S.I.C. divisions 1 to 7), the quality and coverage of the official New Zealand data, supplemented by the Lincoln data, is extremely high, and although there is a considerable shortage of data on investment by sector, this is true of most countries, so that the availability and quality of the New Zealand data stands well in comparison with the data available in other countries.

As far as the rest of the economy is concerned (new I.S.I.C. divisions 7 to 0), however, the New Zealand data is far from adequate. Only one official index of Services output is published, this being the "All Services" index[1], which covers the output of all the Service activities

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(1) Published in "Indexes of Production and Productivity" (62), a supplement to the Monthly Abstract of Statistics (64), and republished in the Official New Zealand Year Book (67).

of the economy which together produce 45.8% of total G.D.P.[1] In most other developed countries considerably more information on the Service sector is published, a subdivision into at least four major sectors usually being performed. In order to examine the rate of growth of output, employment, and hence productivity in the various broad activities in the All Services sector it is therefore necessary to turn to unofficial sources of data. This exercise is performed in Chapters 5, 6, and 7, where a set of accounts of G.D.P. originating in each of the new I.S.I.C. Divisions 7, 8, 9 and 0 is compiled using indicators similar to those used by most developed countries in estimating the rate of growth of Service output. Much of this data is drawn from a monumental work by Gillion and Frankel (23) of the New Zealand Institute of Economic Research. The quality of most of this unofficial data is high, exhibiting a satisfactory degree of consistency and being available in comprehensive detail.

This data is available for the period 1954/55 to 1965/66, and for this reason, although the concern of this thesis is with the growth of the New Zealand economy over the post-war period as a whole, attention has been focussed particularly on the period 1954/55 to 1965/66. These are convenient end-years: they were both years of peak demand, 1954/55 being the first stable year after the dramatic increase in export earnings during the Korean war and the equally dramatic fall at the end of the war; and 1965/66 was a peak year which immediately preceded the balance of payments crisis and devaluation of the New Zealand dollar in November, 1967, which was followed by a period of deflation and falling real per-capita income. The broad patterns of growth revealed for this

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(1) This figure is derived from data presented in Appendix Table 3 to Chapter 7, and relates to 1954/55.

period are in general exhibited by the post-1967 period also,[1] but a detailed study of the years after 1967 will have to await the possible publication of the requisite data.

In order to place the growth of the New Zealand economy in international perspective, data for a number of other economies has been presented along with the New Zealand data throughout this thesis. These countries, the United States, Canada, Japan, and 9 industrial European countries[2] furnish data on output and productivity growth in total and by sector which represents a convenient 'yardstick' against which to measure the New Zealand experience. In addition, the dynamics of structural change in the New Zealand economy can be compared with the behaviour of other economies.

The procedure that has been adopted is to examine first the rate of growth of output, and then the rate of growth of employment and labour productivity. This is one of two possible ways of breaking into the circular system of employment and output-generation: it would have been equally possible to start with the rate of growth of employment that actually occurred, and to proceed from there to an examination of the output that resulted from given employment. The reason for adopting

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(1) A detailed study of the post-devaluation experience of the New Zealand economy has been carried out by P. Hampton (29), using a revised version of the Brownlie-Bergstrom econometric model (6).

(2) In addition to a consideration of these countries, Finland is also examined in Chapter 3, because excellent manufacturing data is available for that country, which presents evident contrasts with the New Zealand experience. Data for Australia is also presented on occasions, but as with New Zealand, data on G.D.P. by sector of origin is limited, particularly before 1958, and compilation of a consistent set of data would be a task of similar magnitude to that undertaken for New Zealand in this thesis.

the former approach is that it focusses attention on the structure of output growth sector by sector. As well as concerning itself with why output per head grew at the rate it did, this thesis examines why output in each sector grew at the rate it did in relation to the other major sectors of the economy.

In carrying out such an examination, particularly when comparison is being made with the behaviour of other countries, it is necessary to calculate growth rates with considerable care: different countries experience booms at different times, and to obtain a valid measure of the rate of growth of output it is necessary for comparative purposes, to calculate growth rates between end-years of approximately equal pressure of demand. By this means it is possible to abstract from the short-period increases in output and labour productivity which occur over the cycle and are unrepresentative of the underlying trend rate of growth. If this procedure is not followed, the same single interval of time being considered instead for each country, some phenomenally-high growth and other peculiarly-low rates result for some countries, which gives a misleading picture. The end-periods for each country were chosen by first selecting the years of peak output relative to trend, and then confirming the appropriateness of these years by ensuring that they were also 'tough' years for unemployment.

In the next chapter the historical origins of the quantitative import restriction system are examined, together with the effects that these quotas had on the post-war development of the economy. Subsequent chapters examine, sector by sector, the rate of growth of output, employment, and labour productivity.

Chapter 2

The imposition of quantitative import restrictions and their effect on the rate of growth of the economy

The purpose of this chapter is to examine what effect quantitative import restrictions can be expected to have had on the rate of growth of the New Zealand economy, both compared with an alternative method of protection by means of a tariff, and in comparison with the alternative policy of maintaining external balance through adjustment of the exchange rate. It is shown that a quota system of protection influences the rate of growth in a complex manner, and that even when due account is taken of the particular way in which the quota system operated in New Zealand, there are a number of forces which acted on the growth of the economy in opposing ways.

Therefore although the quota system does appear to have exerted a continual, if not continuous, influence on the economy it is extremely difficult to ascertain whether the growth rate was or was not adversely affected overall by the import restrictions.

The imposition of quantitative import controls, which were such a characteristic and important feature of post-war New Zealand, came about in the following way. Over the three years prior to 1938, the total net overseas assets of the banking system had been falling, from a mean of £m 42 in 1935 to £m 21 in 1938[1]. Further, the situation deteriorated steadily throughout 1938, so that by the end of the year, the reserves had fallen to £m 6.8. It was in response to this situation that quantitative import controls and exchange restriction were imposed in December, 1938.

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(1) Data taken from the Monthly Abstract of Statistics (64), various issues.

The imposition of any system of protection characteristically has a number of general and relatively immediate effects.

General effects of a system of protection

The first effect of a system of protection is to increase the price of imported items that are subject to restriction, with the consequence that domestic expenditure tends to be diverted towards home-produced goods. These changes in the structure of relative prices and in the pattern of expenditure in turn induce a change in the structure of production, termed the "production effect", which is the phenomenon that has the major implications for the growth of the economy. Two characteristics of the "production effect" phenomenon can be distinguished.

Consider first the production that is induced in the activities which have been protected by the restriction of imports. This induced production is made possible, even in an economy which is at full employment, by the higher price which the commodities produced by the protected activity are now able to command: the protected activity is now able and prepared to pay a higher price in domestic currency than was previously the case for labour, capital goods, and purchased non-factor inputs. Production is thereby expanded beyond the pre-protection level. All the activities which do not receive protection experience a corresponding negative production effect: these activities are less able to pay the higher price (in domestic currency) for labour, capital goods, and purchased non-factor inputs, and if quota protection is applied at a time of full employment, the unprotected activities are less able to compete with the protected sectors, and therefore experience a shortage of labour and other inputs.

The second characteristic of the production effect is that it has a "home-market bias".[1] Protection has enabled the protected activities to sell at a higher price than would have otherwise been the

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(1) The importance of this consequence of protection has been emphasized by Corden (8)

case. The industry therefore tends to become uncompetitive at world prices, selling only for the home market and not for export. The extent to which production effects and home-market bias can be detected in New Zealand is examined in detail later in this chapter, but it is necessary first to consider other effects that protection by means of a quota can be expected to have on an economy.

While the general effects discussed so far would arise whether protection was carried out by means of a quota or by means of a tariff, there are, in addition to these general "tariff effects", a number of additional effects that are peculiar to the quota.

The first of these is that a quota, unlike a uniform tariff (but identically to a suitably-constructed non-uniform tariff), will almost certainly have differential effects on various activities within the protected sector, because quotas are generally applied on a commodity-by-commodity basis. Thus even within the protected part of the economy, some activities will be protected relative to others, will experience a relative rise in price, and hence will experience a relatively-rapid expansion of output.

A second important characteristic of quotas is that the maximum total value of imports that will enter the country in a given period is absolutely certain, if the quota is expressed in value terms - licenses to import are granted up to a certain money value, which cannot be exceeded. Thus in this respect a quota differs from a tariff, the effect of which can be forecast only approximately, after due assessment of the relevant income and price elasticities of demand has been made. Further, the degree of import restriction effected by a quota, both between different commodities and overall, can readily be altered, whereas frequent manipulation of the overall and differential tariff rates would probably be administratively more difficult and certainly has not been characteristic of the post-war operation of any major economy.

The quota system of protection is therefore a more flexible and a more certain procedure than import selection by means of a tariff.

Despite the inherent flexibility of a quota system, however, there are certain restrictions that are likely to operate in practice, and the effect of these restrictions is frequently to cause a quota that was imposed primarily for balance of payments reasons to have effects similar to those of a tariff imposed to protect local industry.

If Government is not prepared to curtail industrial production, or if it is not to inhibit industrial expansion whereby domestic production is substituted for imports, it is necessary to permit the importation of raw materials not produced in the country. Further, if the economy is immature, in the sense that it imports a large proportion of its total requirements of manufactured goods, and exports relatively little, it is unlikely to possess a capital goods sector, so that imports of capital goods also have to be permitted. Inevitably, the burden of restriction falls on consumption goods, many of which are relatively easy to make domestically, so that in operation a regime of quantitative import restrictions is likely to have very similar effects to a protective tariff imposed to foster infant consumption goods industries.

<u>The effects of quantitative import restrictions on the overall rate of growth</u>

Quantitative import restrictions act on the overall rate of growth in a complex way. In examining the net effect, it is convenient to examine first those influences which would result from any form of protection, and then to consider those additional influences which result specifically from protection by quota.

As will be shown below, quantitative import restrictions in New Zealand have served to protect industry, and particularly the consumption-goods industry. While it is the "production-effects" of

this protection which are of major importance for the rate of growth, there is one aspect of the "expenditure-effect" that is also of importance. Protection of the consumption-goods industry raises the price of consumption goods relative to the price of other, non-protected, goods. In particular, such protection raises the price of consumption goods relative to capital goods which, for the reasons discussed above, are characteristically restricted very little, if at all, by quotas. This expenditure effect in turn encourages capital formation, relative to what would have been the case had relative prices not been so altered, which can be expected to have a positive effect on the long-run rate of growth of output.

There are, in addition to this expenditure effect, many factors associated with the production effect which influence the overall rate of growth. Firstly, the protection of industry encourages production in an activity in which there are large potential gains to be obtained from economies of scale. It will be shown in the next chapter that in New Zealand, as in many countries, the potential economies of scale in industry are large. To the extent that these scale economies are larger in industry than in the unprotected activities, notably agriculture, it follows that quantitative restrictions exert a positive influence in this respect on the rate of growth. It is not immediately clear, however, whether this benefit accrues from a continuous, dynamic effect or from a comparative-static effect of strictly limited duration. If an industry which receives protection grows rapidly, and in the course of so doing benefits from economies of scale and becomes competitive at world prices, thereafter attracting a growth in demand from expanding foreign countries, the scale effect could be held to be dynamic. But if the protected industry grows rapidly under protection, supplying the major part of the home market but still remaining uncompetitive at world prices, the gain from economies of scale stops once the home market is saturated. Given

that, as was seen in Chapter 1, very little of New Zealand's manufactured output is exported, it would appear that most of the gain from economies of scale in industry was of the "comparative-static" kind, which exerts a positive effect on the growth rate for only a limited period of time. In addition to scale effects there are other externalaties, notably learning effects, which can be obtained from protecting industry, and which exert a positive influence on the growth rate. Further, to the extent that there is any validity in the theory that the low rate of growth of the United Kingdom economy is due in part to the poor outlook envisaged by investors, due in turn to the "stop-go" management of the economy, it ought to follow that the effect of protection of expanding industry and thereby lessening the susceptibility of the New Zealand economy to fluctuations in foreign demand for its agricultural output has been to increase expectations and hence improve the overall rate of growth.

In addition to these general effects, which would result from tariff protection of industry as well as from quota protection, there are a number of factors peculiar to the quota system which can be expected to influence the growth rate.

Firstly, in addition to the fact that protection increases the relative size of the industrial sector and thereby reduces the effect of foreign fluctuations in demand for New Zealand's agricultural output, is the fact that (as was seen in Chapter 1) a quota reduces even further the effect of fluctuations in export demand on the economy as a whole, by switching demand on occasions towards and on other occasions away from home production as the state of the foreign reserves permits. Thus the general effect of protection of lessening "stop-go" effects is further aided by the particular operation of quantitative restrictions, to the potential benefit of the growth rate.

Secondly, while protection of industry may in general lead to large-scale production, it is also possible for the actual administration

of a quota system to encourage relatively small-scale production. Licenses to import can be granted to large firms in a deliberate attempt to encourage large-scale production, or licenses, each of a lower individual value, can be granted to a larger number of smaller firms in order to stimulate competition, thereby reinforcing the inherent tendency of a quota system to foster small-scale production. It is likely that, in New Zealand, the latter situation was characteristic of the administration of the import-licensing system, although it is not possible to test this contention because this would require access to official information which is not published.

To the extent that this has been the case, the operation of quantitative restrictions has been to exert a negative effect on the rate of growth of output. Furthermore, over time the degree of import restriction effected through import controls may increase or decrease, although it is extremely difficult to establish the extent to which this has happened in practise. To the extent that the extent of protection has decreased, it is likely that some firms at least will have become competitive at world prices and the economy will have experienced scale-economy gains of the dynamic kind.

To the extent, however, that the degree of protection increased over the period, it is likely that progressively more small-scale industry became established at progressively-higher real resource cost to the economy, a phenomenon that would exert a negative influence on the overall rate of growth of output.

It would therefore appear that protection exerts a considerable number of influences, some positive and some negative, on the overall rate of growth of output. It is therefore important to establish, in a comparative sector-by-sector study, the extent to which growth in New Zealand has been less than, on certain criteria, it ought to have been. This is undertaken in the subsequent chapters. Before this is undertaken,

however, it is instructive to examine the precise structural effects that quantitative restrictions had when they were first imposed, and to examine the extent to which quantitative restriction continued to have an influence on the economy after a number of years had passed.

The general effect of Import quotas on the New Zealand economy: Immediate effects

It can be seen from Chart 2-1 below that the immediate effect of the imposition of quotas was the characteristic one of restricting imports of consumer goods. While small reductions took place in the value of producers' goods imports in 1938, 1939, 1941,and 1942, imports of consumers' goods dropped spectacularly. In just three years, the value of imported consumers' goods fell from about £m 15 to just under £m 7. The value of imported fuels and lubricants did not undergo significant change, but the value of imported transport equipment also plummeted, from just £m 8 to under £m 3 in 1940. These changes are summarised in Table 2-1 below.

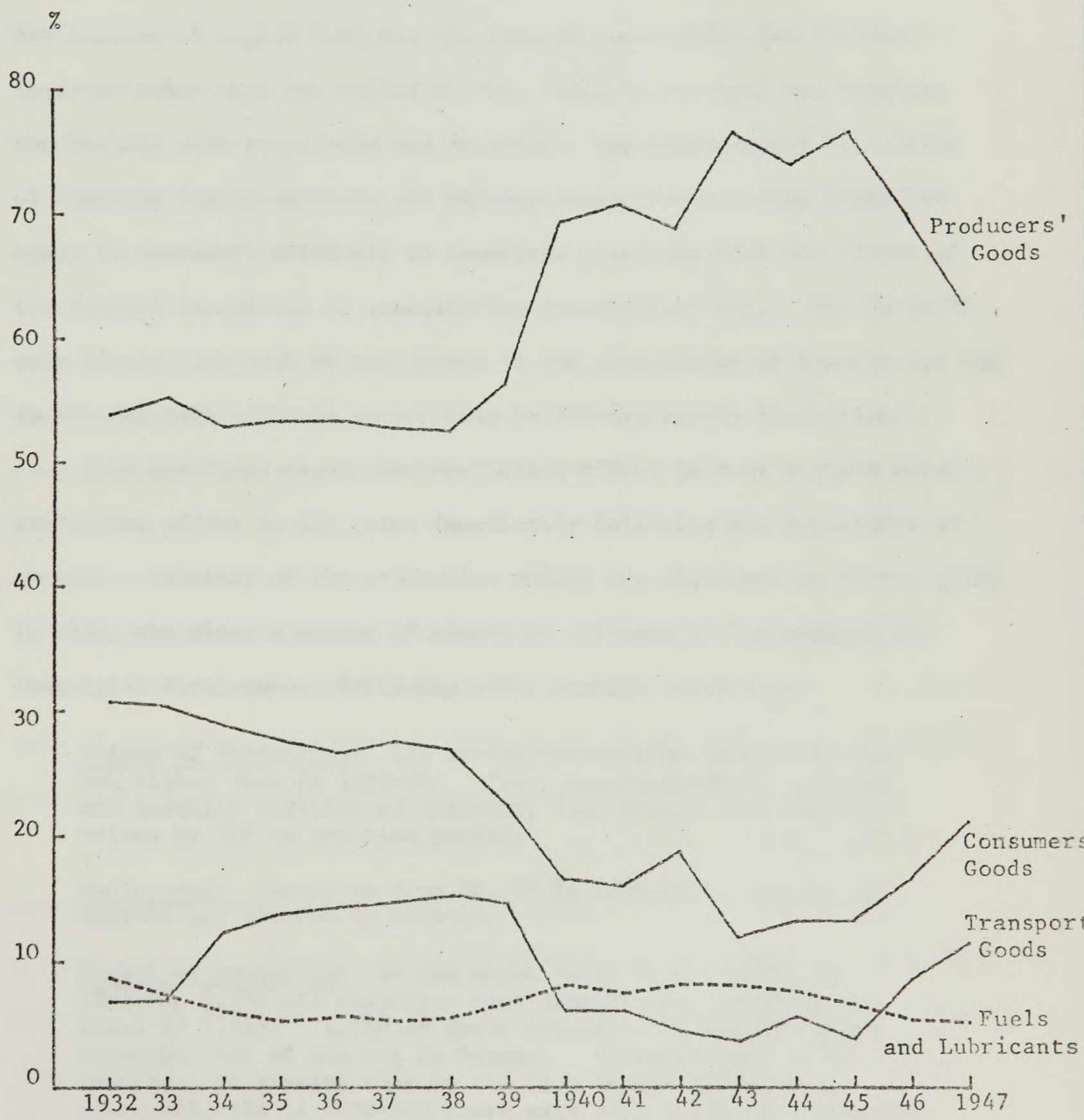
Table 2-1 Average composition of Imports, New Zealand

	Proportions by value, current prices 1932-38 %	1941-47 %
Producers' goods	53.4	71.2
Consumers' goods	28.3	15.8
Transport goods	12.0	6.2
Fuels and lubricants	6.2	6.6
Other	0.1	0.2
	100.0	100.0

Source: Derived from data in Appendix Table 2-1 to this chapter

In addition to the demand restrictions imposed by the New Zealand authorities, it must be recognised that foreign supply restrictions were

Chart 2-1 The Composition by value of New Zealand Imports, 1932 to 1947



Data Source: Appendix Table 2-1

also important in curtailing the flow of imports into New Zealand in the later years considered in Table 2-1 above. In 1938, by far the largest supplier of New Zealand's imports was the United Kingdom, which in supplying £m 24.9 worth of imports, 45% of the total, was nearly four times as important as the next biggest supplier, Australia. The volume of U.K. exports decreased greatly during the war years, and there were few sources of supply left for the type of goods which New Zealand imported other than the United States, which in the past had supplied New Zealand with relatively few imports. The simultaneous imposition of domestic import controls and foreign supply restrictions therefore makes it extremely difficult to ascertain precisely what the effect of the initial imposition of quantitative restrictions was. But it would seem likely that much of the change in the composition of imports was due to the domestic controls rather than to foreign supply limitations.

This resultant expenditure-switching effect in turn brought about a production effect in the years immediately following the imposition of quotas. Evidence of the production effect was discussed by Wilson (104) in 1950, who cited a number of pieces of evidence of 'an upsurge in industrial development' following 1938, amongst which are:

> Volume of Production: All factory-production in 1946-47 was 40% higher than in 1938-39. 'True manufacturing', (or what are normally regarded as secondary industries) increased in volume by 76% in the same period.
>
> Employment: Increased from 80,000 in 1934-35 to 108,000 in 1939-40 and 134,000 in 1946-47.
>
> Number of Factories: In the eight years from 1938-39 to 1946-47, 1,500 new factories were established, bringing the total to 7,642. 1,150 of these commenced in the two years after the end of the war in Europe. Nevertheless, it is important to observe that in the five immediately-pre-war years (1933-34 to 1938-39) there were over 1,150 new factories.

This evidence is in fact however an over-simplification of the production effect that the imposition of quantitative restrictions had on the quota of New Zealand industry. It can be seen from Chart 2-2 that rapid growth of New Zealand duty started six years before the imposition of import controls, and that the growth of industrial output was no more rapid after the imposition of controls in 1938 than it had been before. Thus Wilson's evidence of the production effect of protection is by itself inadequate. The real significance of import controls lies not in the fact that industry grew fast after 1938, but in the fact that it was able to continue to grow fast after 1938, when labour in New Zealand had become scarce.

In 1936 unemployment, at 36,000 was at an all-time high(1), so that for some years prior to 1936, and for a few years after, there was a pool of idle labour, and perhaps capital as well, available for manufacturing expansion. But after the outbreak of war in 1939 the Armed Forces grew rapidly, reaching a peak level of 154,000 by 1942, and unemployment was almost completely eliminated. The Manufacturing sector therefore had to compete in the market for the labour not enlisted in the armed forces, and the effect of the manufacturing sector's increased rate of effective protection, brought about by the imposition of quotas, would have been to increase its ability to compete.

Labour force data before 1946, when Department of Labour half-yearly surveys were commenced, is not good. It is interesting to examine, however, the Philpott (77) estimates of farm labour, which were obtained from Census returns and the official Agricultural and Pastoral Statistics. This data which is sufficiently accurate for the present purpose, is plotted below in Chart 2-3, and shows that while the

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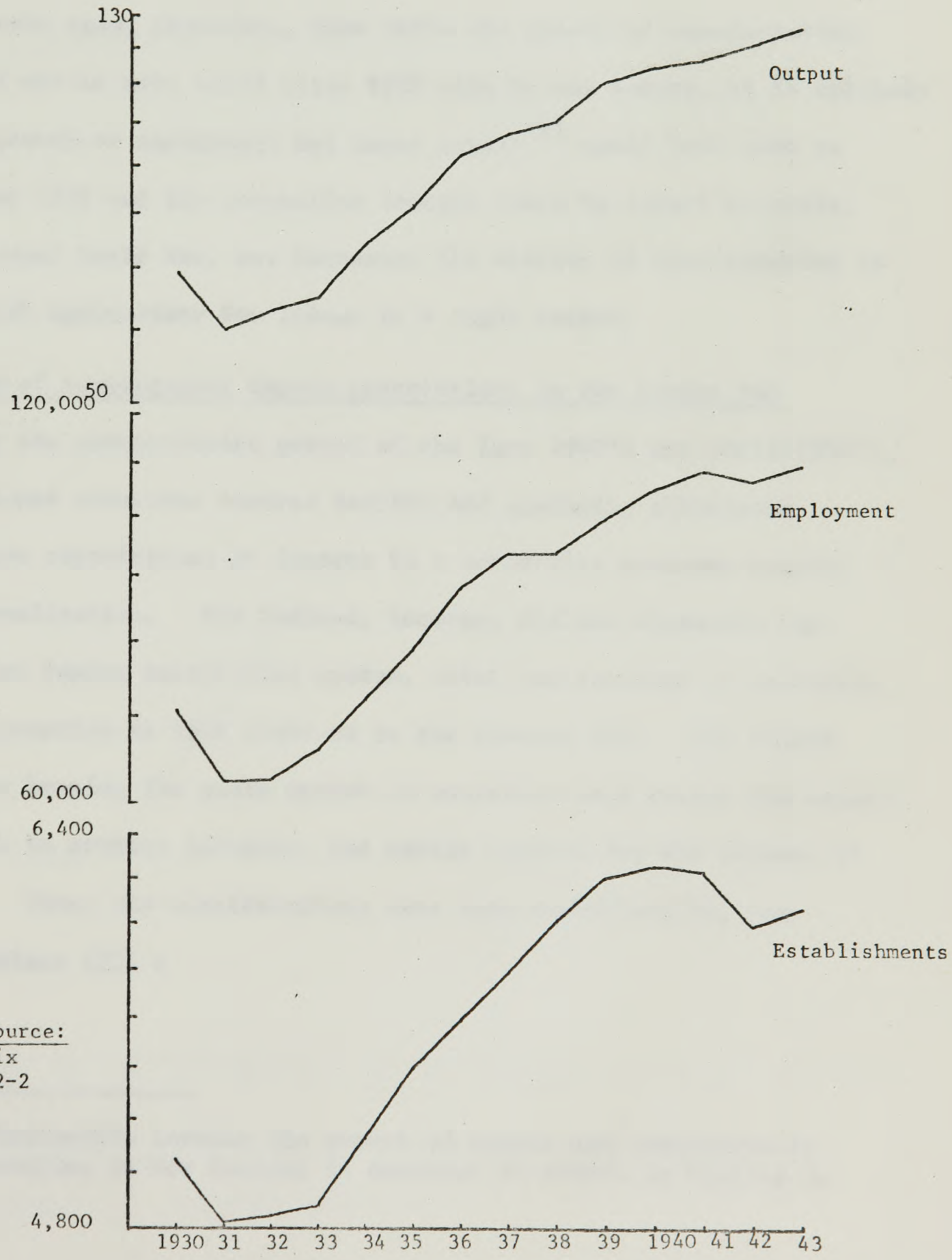
(1) Data taken from New Zealand Yearbook (67), various years.

Chart 2-2 The Growth of the volume of gross output, employment, and the number of establishments, manufacturing sector



Data Source:
Appendix
Table 2-2

Manufacturing labour force grew unchecked right throughout the war years, it did so in large part at the expense of the Agricultural labour force, which dropped heavily after 1938. What is particularly interesting is that, despite this large outflow of labour, the growth of agricultural output continued apparently unchecked, a phenomenon which is examined in Chapter 3, where induced technical change in Agriculture is discussed.

It would seem, therefore, that while the growth of manufacturing employment was no more rapid after 1938 than it was before, it is unlikely that the growth of employment and hence output[(1)] would have been so rapid after 1938 had the protection brought about by import controls, and the Second World War, not increased the ability of Manufacturing to compete with Agriculture for labour in a tight market.

The effect of quantitative import restrictions in the longer run

After the protectionist period of the late 1940's and early 1950's, most developed countries lowered tariffs and gradually eliminated quantitative restrictions on imports in a world-wide movement towards trade liberalisation. New Zealand, however, did not dismantle its quantitative import restriction system, which has remained in operation from its inception in 1938 right up to the present day. The stated reasons for keeping the quota system in operation were partly the desire to continue to protect industry, and partly concern for the balance of payments. These two considerations have been emphasised by, for example, Holmes (32) :

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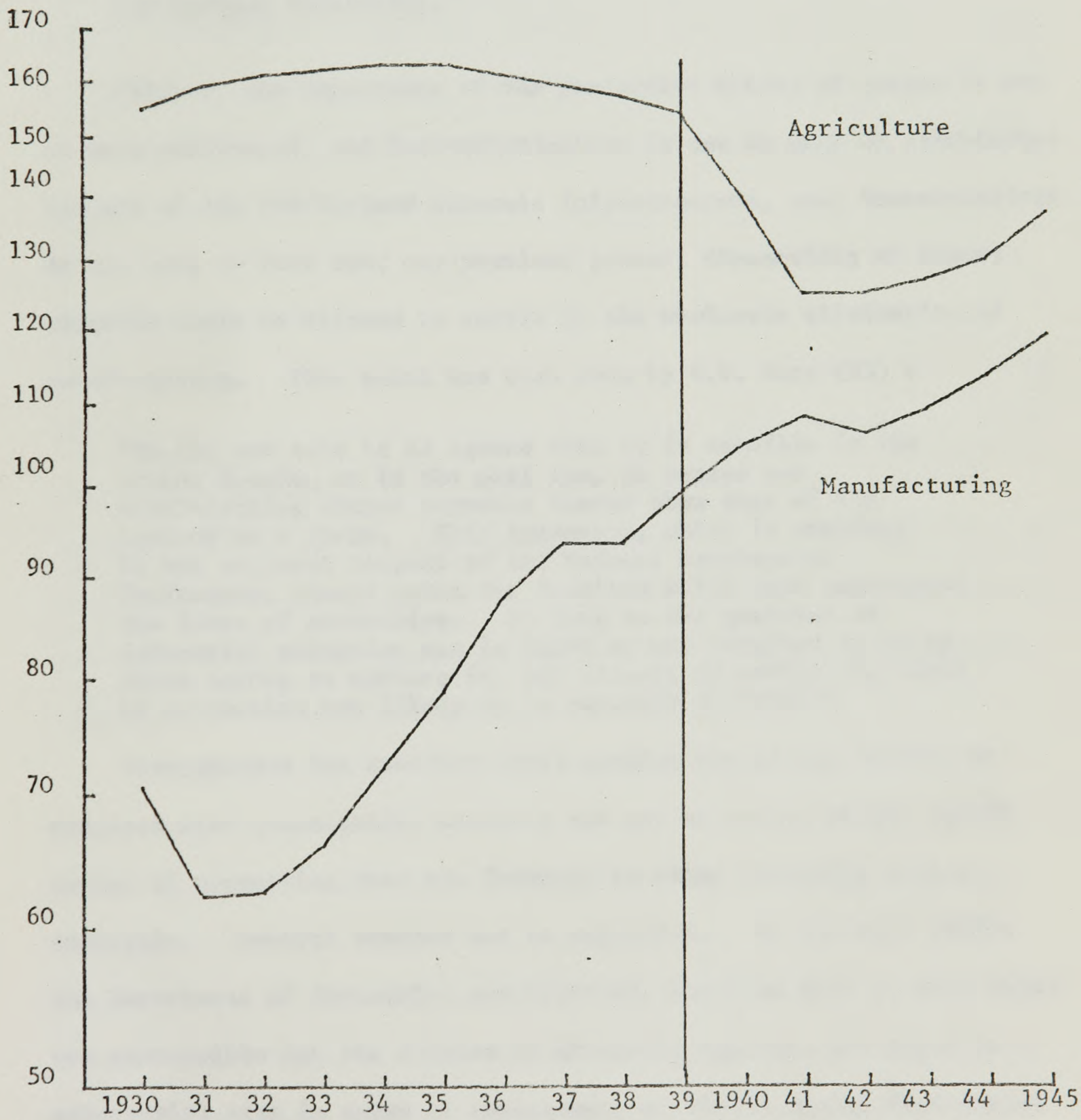
(1) The relationship between the growth of output and employment in Manufacturing in New Zealand is examined in detail in Chapter 3.

Chart 2-3 Employment in Agriculture and Manufacturing, 1930 - 1945



Data Source: Appendix Table 2-3

> "Labour administrations, in office 1935-49 and 1957-60, have adopted these direct controls willingly, seeing them as potent inducements to expansion of manufacturing and means to enable Government to influence the direction of development by private enterprise. National Governments have in principle opposed this 'bureaucratic' method of regulation, and have in the 1960's exempted an increasing range of goods from the controls, especially materials, fuel and equipment for industry. But comprehensive licensing of imports remains, primarily designed to protect reserves of overseas currency from depletion but also providing a substantial shield against overseas competition for many New Zealand industries."

Further, the importance of the protective effect of quotas is now so well understood, and industrialisation is now so much an established feature of the New Zealand economic infrastructure, that industrialists do not have to fear that any promised gradual dismantling of import controls could be allowed to result in the wholesale elimination of manufacturing. This point has been made by W.D. Rose (83) :

> "We can now take it as agreed that it is sensible in the coming decade, as in the past two, to expand our manufacturing output somewhat faster than that of the economy as a whole. This consensus, which is explicit in the sectoral targets of the National Development Conference, should relax the tensions which have surrounded the issue of protection. So long as the question of industrial expansion was in doubt or was imagined to be by those hoping to nurture it, any attempt to modify the tools of protection was likely to be strongly resisted."

Nevertheless the question still remains why it was decided to continue with quantitative controls and not to switch to the tariff system of protection that was favoured by other countries such as Australia. Several reasons can be suggested. By the late 1950's the Department of Industries and Commerce, which as will be seen below was responsible for the process of licensing imports, had grown to a substantial size in terms of employment, so that a change from import licensing to some other system of import control would have caused administrative difficulties of the same order of magnitude as those encountered when, for example, the system of taxation is radically changed.

Administrative difficulties of this size can, of course, be overcome if the pressure to bring about change is strong enough. But not only Government, but also much of industry, had a considerable vested interest in leaving the system unchanged, because securing protection by a tariff makes the nominal rate of protection explicit, whereas under a quota system the degree can only be guessed at. Those industrialists who were, or felt that they were, heavily protected by import licensing would therefore be unwilling to see the system changed in such a way as to bring about the publication of the magnitude of the protection they were enjoying.

Import licenses are nominally issued by the Customs Department, but effective authority lies with the Department of Industries and Commerce, which establishes the criteria by which licenses are granted and which, in advising the Customs Department which licenses to grant, screens all applications for licenses to import. The first four licensing Schedules were for six-monthly periods, but thereafter until 1961 Schedules were issued for full calendar years. The 1961 schedule was extended 6 months beyond the end of the calendar year, whereafter Schedules have always been issued on a June-year basis.

The original basic licensing schedule was divided into three parts: for one group (D), no licenses at all were issued; for the second group (C), each item was given individual consideration, and for the third group, basic items, licenses were issued for a value proportionate to the amount of goods each applicant had imported in a base year. There was initial discrimination against imports from non-sterling areas, but this was reduced in 1951 and reduced still further in 1962. Innumerable modifications were made to the system over time, and gradually the proportion of total imports that were

subject to control has been reduced, although there have always been considerable year-to-year variations in the extent to which control was exercised. The over-riding characteristic of the system was the ad hoc nature in which the majority of decisions were taken. While criteria were believed to exist, they were inevitably so broad that any decision could be justified ex post. The predominant consideration always was whether the license being applied for was for an item which could be manufactured in New Zealand. If it could, albeit at a higher price, the license was almost invariably refused.

While it was possible in the previous section to establish a strong presumption that these restrictions on imports affected both the composition and the quantum of imports over the period immediately following 1938, it is not possible to establish by an examination of this sort whether quotas continued to have an effect after a number of years had passed: over time expenditure-switching policies cause the structure of production to change and bring about shifts in the distribution of income. Both these changes affect the demand for imports, so that it is invalid to infer directly from an examination of the volume or composition of imports that import controls in later years were of continuing importance. Nevertheless, all the evidence that there is is consistant with import controls having had a continuing influence on the economy up to the present day.

Firstly, over the period from 1938 to 1967 the proportion of manufactured output that was exported was extremely small, which suggests that the quantitative import restrictions were continuing to exert a home-market bias throughout the 1950's and 60's. It can be seen from Table 2-2 below that in New Zealand in 1965 less than 4% of manufacturing output was exported, whereas in all of the other countries the proportion was considerably higher. The country immediately above New Zealand was the United States (8.7%) followed by France (20.7%) and Canada (31.5%). A proportion of 69.8% was achieved by the Netherlands.

Table 2-2 The value of Manufacturing output and the value of exports of manufactures, various countries, 1965

Country	Currency	Value of G.D.P. originating within the Manufacturing Sector (1)	Value of Exports of Manufactures (2)	(2) ÷ (1)
Canada	$ x 10^6	12997	4096	0.315
France	Francs x 10^9	173.48	35.92	0.207
West Germany	DM x 10^9	194.52	63.62	0.327
Italy	Lira x 10^9	8558	3505	0.410
Japan	Yen x 10^9	7154	2831	0.396
Netherlands	Guilders x 10^6	19133	13363	0.698
Norway	Kroner x 10^6	12200		
United Kingdom	£ x 10^6	10641	3991	0.375
United States	$ x 10^9	198.5	17.26	0.087
New Zealand	$ x 10^6	810.0	29.7	0.037

Sources: New Zealand: Value of manufactured exports; 1971 New Zealand Year Book (67) page 477. Value of G.D.P. originating within Manufacturing: Appendix 3 to Chapter 7.

All other countries: Value of manufactured exports: U.N. Monthly Bulletin of Statistics (99), Special Tables. Value of G.D.P. originating within the Manufacturing sector: National Accounts of O.E.C.D. countries 1960-1970 (76).

Thus the domestic component was by far the more important source of demand for industrial output, and this demand grew relatively rapidly. Over the period of the 1950's and 1960's industrial output grew in New Zealand at an average annual rate of 6.3% per year, a rate which was exceeded only by Japan, West Germany, Italy, and Australia[1].

In an open economy, such rapidly-rising industrial production, associated with rapid growth in the transport and distribution sector, causes a rising demand for imports, which can result in familiar crises in the balance of payments, deflation, and a reduction in the rate of growth of output. The conventional remedy for this problem is to set the exchange rate at a competitive rate so that export demand, rather than domestic demand, induces a satisfactorily high rate of growth of industrial output and rising real incomes.

In New Zealand, however, any periodic tendency for imports to grow more rapidly than exports has been able to be counteracted by the application of quotas. This, together with expansive fiscal policy, has kept the pressure of demand high at all times, so high in fact that in no year since 1952 did the level of manufacturing production fall below the previous year's level, which meant that there were no manufacturing-led recessions like those in the United Kingdom in 1958, 1962, and 1967. The lowest year-on-year rate of increase of manufacturing production in New Zealand after 1952 was 0.6% in 1956/57, and in each of the years 1963/64 and 1964/65 output grew by more than 10%.[1]

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(1) This data is taken from Table 3-2 in Chapter 3.

In addition to this general structural evidence, there is further support for the contention that import controls continued to exert an influence on the New Zealand economy in the 1950's and 1960's. Firstly, there were extremely large fluctuations in the volume of imports that entered New Zealand, larger positive fluctuations correlating almost perfectly with election years[1] - this can be seen from the data in Table 2-3 below, in which election years are indicated by an asterisk.

These fluctuations in imports are far larger than could possibly be accounted for by the actual fluctuations of aggregate demand, and were almost certainly caused by changes in the intensity with which the import-licensing schedule was administered. Econometric evidence that is consistent with this argument has recently been presented by Deane and Lumsden who estimated a regression equation to explain the volume of imports, in which a dummy variable to represent the effect of quantitative restrictions was found to be statistically significant. The variable took the value +1 in periods of relaxed control, 0 in periods of moderate control, and -1 in periods of tight control[2].

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(1) Fluctuations in the level of economic activity that correlate with the political cycle have been noted for a number of countries, notably Sweden, the U.S. and the U.K., but the correlation in New Zealand is by far the most marked - see Nordhaus (70).

(2) See Deane and Lumsden, Reserve Bank of New Zealdnd Research Paper No.4., page 15, equation A1.

Table 2-3 The growth of the volume of New Zealand imports 1954 to 1967

March years	Value of Imports, $m, 1954/55 prices	Change, %
1954*	519.5	-
1955	545.4	4.99
1956	511.5	-6.22
1957*	564.1	10.28
1958	598.1	-11.70
1959	470.0	-5.64
1960*	571.2	21.53
1961	572.6	0.25
1962	556.1	-2.88
1963*	658.6	18.43
1964	678.2	2.98
1965	751.8	10.85
1966*	768.8	2.26
1967	628.8	-18.21

* indicates an election year.

Source: 1962/63 and 1963/64 New Zealand External Trade Statistics, page 63, and 1968/69 New Zealand External Trade Statistics, page 70.

Additional evidence of the continuing importance of import controls is the fact that some commodities at least were in virtually continuous short supply at the prevailing exchange rate: for example there was almost always a queue for motor cars[(1)], and in some years new cars commanded a premium of up to 20% on their landed price. Foreign equities, particularly those of Australian companies, could be sold after a stipulated waiting period so as to obtain foreign exchange, and on occasions these equities fetched a premium of approximately 20% from stockbrokers. Because licenses were non-transferable between different classes of commodity, however, it is not possible to infer from such evidence that there was necessarily excess demand for all manufactured commodities at the prevailing exchange rate.

Inevitably, much of the evidence that import controls continued to exert an influence in the New Zealand economy must be subjective. Elkon (18) considers that the degree of restriction afforded by the administration of quantitative import restrictions declined considerably during 1958-1964, but that thereafter restriction became more severe up until the devaluation in 1967. Further, Elkon's calculations suggest that in this latter period the degree of import restriction was possibly slightly higher than in the 1955-1958 period[(2)], and it is apparent that the degree of restriction on various broad commodity groups varied considerably over time.

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(1) For a description of the disequilibrium market, see Turnovsky (94).

(2) This matter is discussed in Chapter 7.

Conclusions

It is apparent that any form of protection acts in a complex variety of ways on the rate of growth of an economy, so that it is difficult to generate an a priori expectation of the way in which the overall rate of growth of the economy will be affected. In the case of protection by means of import quotas, the system that was in continuous use in New Zealand, the situation is even more complex. The degree of protection can and probably does vary over time, as well as between different commodities. Nevertheless, as was noted in Chapter 1, there is a quite widely-held view in New Zealand that import controls were responsible for a considerable distortion in relative prices, and that this distortion was in turn responsible for New Zealand's relatively low rate of growth of output per head. In the following chapters the rate of growth of output, employment, and labour productivity is examined for each major sector in direct comparison with the performance of other high-per-capita-income countries, in order to establish on a sectoral basis the extent to which the New Zealand performance can be said to have been poor.

Appendix Table 2-1 Composition of Merchandise Imports, Broad Categories, War supplies excluded

Year	Producers' Goods %	Consumers' Goods %	Transport Goods %	Fuels and Lubricants %
1932	53.9	30.7	6.8	8.7
1933	55.3	30.3	7.0	7.3
1934	52.9	28.8	12.3	6.0
1935	53.4	27.6	13.8	5.2
1936	53.4	26.6	14.3	5.7
1937	52.7	27.5	14.7	5.2
1938	52.4	26.8	15.2	5.6
1939	56.3	22.4	14.5	6.7
1940	69.3	16.5	6.1	8.1
1941	70.7	15.9	6.1	7.4
1942	68.7	18.7	4.4	8.2
1943	76.4	11.9	3.6	8.0
1944	73.8	13.2	5.6	7.5
1945	76.4	13.2	3.8	6.5
1946	69.8	16.5	8.5	5.3
1947	62.5	21.0	11.4	5.1

Source: Derived from value of imports by categories, New Zealand Monthly Abstracts of Statistics (64), various issues.

Appendix Table 2-2 Employment, Output, and the number of Establishments, New Zealand Manufacturing, 1930 to 1944

Production Year	Number of Persons Engaged	Number of Establishments	Index of volume of Production, 1938-39 = 100
1930/31	70,625	5,047	69
1931/32	62,335	4,823	60
1932/33	62,583	4,847	63
1933/34	65,961	4,883	65
1934/35	72,095	5,126	74
1935/36	78,701	5,391	81
1936/37	87,822	5,584	92
1937/38	93,534	5,780	97
1938/39	93,638	6,002	100
1939/40	99,349	6,198	110
1940/41	104,784	6,252	114
1941/42	108,275	6,225	116
1942/43	106,179	5,985	120
1943/44	109,221	6,062	125

Sources: Employment and number of establishments: 1969 New Zealand Year Book (67), Historical Series, page 1052.

Volume of Production: 1969 New Zealand Year Book (67), page 505.

Appendix Table 2-3. Employment, Agriculture and Manufacturing, 1930 to 1945

Year	Agricultural Employment $x10^3$	Manufacturing Employment $x10^3$
1930	155	70.6
1931	159	62.3
1932	161	62.6
1933	162	66.0
1934	163	72.1
1935	163	78.7
1936	161	87.8
1937	159	93.5
1938	157	93.6
1939	154	99.3
1940	140	104.8
1941	125	108.3
1942	125	106.2
1943	127	109.2
1944	130	113.5
1945	137	118.9

Sources: Agricultural employment: Philpott and Ross (77), page 41.

Manufacturing employment: Industrial Production 1965/6 (63), page 19.

Chapter 3

Industry - the growth of output, employment, and labour productivity

Introduction

This chapter is concerned with the growth of output, employment, and productivity in the four industrial sectors, Manufacturing, Public Utilities, Mining and Construction. In Chapter 1 it was argued that it is logically possible to commence such a study by first examining any one of the three variables, proceeding in turn to a second, and obtaining the value of the third by identity. The procedure adopted in this and succeeding chapters is to consider first the rate of growth of output. This has the advantage of focussing attention on the relative rates at which different sectors grew over the period, emphasising the structural shift that has occurred in the production of total output. The rate of structural shift is then compared with the experience of other countries. Thereafter the rate of growth of employment, and hence of productivity, is examined, and the New Zealand productivity performance is compared, sector by sector, with that of other countries.

The growth of Manufacturing output 1954/55 to 1965/66.

The value in constant 1954/55 prices of the G.D.P. originating within Manufacturing is given for each of the years 1954/55 to 1965/66 in Table 3-1 below. The average rate of growth over the period was 6.3% per year, which in international comparison is quite high. It can be seen from Table 3-2 that only in Japan, West Germany, Italy and Australia did Manufacturing grow more rapidly than in New Zealand over a similar period. In the majority of the countries Manufacturing grew more slowly than in New Zealand, with two countries, the United States and the United Kingdom, growing at only about half the New Zealand rate.

Of the three other industrial activities[1], Mining is the smallest, the value of G.D.P. originating within this sector being £m 19 in 1954/55, which is only 1% of total G.D.P.[2]. The major activities in this sector are the mining of coal, and the mining of sand, rock and gravel for building aggregate as well as for roads and ballast. The quantity of coal being mined has slowly declined over the period, but the quantity of sand rock and gravel extracted has grown over the period in response to growing demand, mainly from the construction industry.

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(1) The subdivision of industry into these four components is common practice: for example, in recent OECD publications, Mining, Public Utilities and Construction are separately distinguished, being new I.S.I.C. divisions 2, 4 and 5 respectively.

(2) See Appendix Table 3 to Chapter 7.

Table 3-1 Index and value in constant 1954/55 prices of G.D.P. originating within Manufacturing in New Zealand

Production Year	Index 1954/55=100.0	Value, $m 1954/55 prices	Year-to-year change, %
1954/55	100.0	405	-
1955/56	104.8	424	4.8
1956/57	106.5	431	1.6
1957/58	113.9	461	6.9
1958/59	120.3	487	5.6
1959/60	124.4	504	3.4
1960/61	136.6	553	9.8
1961/62	143.6	582	5.1
1962/63	150.1	608	4.5
1963/64	165.8	671	10.5
1964/65	187.3	759	13.0
1965/66	200.1	810	6.8
	(1)	(2)	(3)

Source: Column (1) : The index of the volume of Manufacturing production is obtained from "Indexes of Production and Productivity", Supplement to the Monthly Abstract of Statistics (62).

Column (2) : The constant-price value of G.D.P. originating within Manufacturing is obtained as $405 x column (1) / 100. The base-year value of $m405 is obtained from Appendix 3 to Chapter 7.

Column (3) : From column (1).

Average rate of growth 1954/55 to 1965/66 = 6.3% per year.

Table 3-2 Growth rates of Manufacturing Output, various countries

Country	Period	Growth Rate, % per year[1]
Japan	1953-1964	13.5
West Germany	1951-1965	8.4
Italy	1951-1963	7.9
Australia	1958-1966	6.5
New Zealand	1954-1965	6.3
Denmark	1954-1965	6.3
Netherlands	1951-1965	5.9
France	1951-1964	5.8
Canada	1951-1966	5.2
Austria	1951-1966	5.2
Belgium	1951-1964	4.8
Norway	1951-1965	4.3
U.S.	1951-1966	3.8
U.K.	1951-1965	3.3

(1) For the method of calculation of growth rates in this and all succeeding tables, see the Appendix "Sources of data and the calculation of growth rates" at the conclusion of the thesis.

(2) Sources: New Zealand - Table 3-1.

All other countries - derived from data in O.E.C.D. National Accounts Statistics (75).

The mean rate of growth of mining output over the period was 4.0% per year[(1)].

The Public Utilities, providing gas, electricity and water, produced 1.6% of total G.D.P.[(2)], and the rate of growth of output was high, the average rate being 8.1% per year. About three quarters of the total supply of electric power to the national grid system was generated in hydro-electric power stations, the balance being generated in thermal and geothermal stations. Gas is generally produced in local gasworks, although following the discovery of natural gas in 1959 a certain amount of piping of gas between regions has been undertaken.

Construction is a much larger activity than either Mining or the Public Utilities, the amount of G.D.P. originating within this sector being $m 154 in 1954/55[(1)], this value representing 8.2% of total G.D.P. Characteristically this sector, which undertakes residential, commercial and civil engineering projects grows rapidly in those countries where the overall rate of growth of the G.D.P. is high. This tendency can be seen from the data in Table 3-3 and from the summary regression equation[(3)] beneath. This equation implies that, given the 4.7% annual rate of growth of G.D.P. in New Zealand[(4)], a 5.4% rate of growth of construction output would be expected. This is somewhat higher than the rate recorded in the official statistics[(5)], of 4.1% per year. It may be that the official estimate in fact somewhat underestimates the true rate of growth of construction output. Information on the nature of the

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(1) See Appendix Table 3 to Chapter 7.

(2) In 1954/55 - see Appendix Table 3 to Chapter 7.

(3) This equation, like all other such summary equations presented in this thesis, was estimated without including the New Zealand data, so that the New Zealand experience would not contribute to the derivation of a general relationship with which, subsequently, New Zealand was to be compared.

(4) This value is taken from Appendix Table 3 to Chapter 7.

(5) "Indexes of Production and Productivity" (62). See also Appendix Table 3 to Chapter 7.

indicators used in the compilation of the official index of output is not published[1], but alternative information compiled by Gillion and Frankel (23) suggests that the rate of growth of Construction output was about 5.0% per year[2].

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(1) This matter is discussed further in Chapter 5.

(2) Gillion and Frankel, op. cit. Table 26, page 51. The indicators used by Gillion and Frankel are described in detail by them at pages 13 to 16, and appear to have been well-chosen and representative. Unfortunately information used in the compilation of the official index is not published - this matter is discussed further in Chapter 5.

Table 3-3 Construction and Output growth, various countries

Country	Period	Rate of growth, % per year	
		Construction $q_{construction}$	G.D.P. q_{gdp}
Japan	1953-1964	14.4	9.2
Italy	1951-1963	8.5	5.4
West Germany	1951-1965	7.0	6.4
France	1951-1964	6.8	5.1
Canada	1951-1966	6.1	4.7
Austria	1951-1966	5.0	4.4
New Zealand	1954-1965	4.1	4.7
U.K.	1951-1965	3.6	2.7
Belgium	1951-1964	2.9	3.5
United States	1951-1966	2.1	3.6
Norway	1951-1965	1.9	4.1

Summary regression(1):

$$q_{construction} = \underset{(1.4)}{-3.6} + \underset{(0.267)}{1.897}\, q_{gdp} \qquad R^2 = 0.848$$

Sources: New Zealand : Appendix Table 3 to Chapter 7
All other countries : Calculated from data in O.E.C.D. National Accounts (75)

(1) In this regression, as in all other comparative regressions in this thesis, New Zealand data was not included in the estimation, because it would be inappropriate for the New Zealand data to contribute to a relationship with which New Zealand was then to be compared.

The growth of employment and labour productivity in Manufacturing

It was shown in the previous section that over the period 1954/55 to 1965/66 the rate of growth of output in Manufacturing was 6.3% per year, which was high in international comparison, being exceeded only by Japan, West Germany, Italy, Australia and Austria. It might be supposed therefore that the rate of growth of manufacturing employment would also have been relatively high, and this was indeed the case. It can be seen from column 2 of Table 3-4 that in only three countries, Japan, West Germany and Italy, was the rate of growth of employment in Manufacturing more rapid than it was in New Zealand.

Although, as can be seen from the output and employment data, there is a general tendency for employment growth to be more rapid in those countries where output growth has been more rapid, it is to be expected that the precise rate of employment growth necessary to achieve a given amount of output growth would be influenced by the rate of capital formation. Unfortunately reliable information on the rate of growth of the capital stock in Manufacturing is not available for many countries,[1] but information on the value of investment expenditure in Manufacturing, both in current and constant prices, is published,[2] so that it is possible to compute for a number of countries the ratio of manufacturing investment to total manufacturing output, thereby obtaining an approximate measure of the relative proportions of output in different countries that have been devoted to capital formation. The relationship between these three variables, the rate of growth of employment, the rate of growth of output, and the investment-

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(1) Capital stock estimates have been prepared for New Zealand Manufacturing by Francis (21). Particular care has to be exercised in interpreting such a series, particularly in an environment where strong increasing returns to scale prevail. This matter is discussed in detail, with illustrations, later in this chapter.

(2) See "National Accounts of O.E.C.D. Countries", (75) and (76).

Table 3-4 Growth Rates of manufacturing output, employment and productivity, and the average value of the manufacturing investment-output ratio, various countries. (1)

Country	Growth Rate, % per year			Investment
	Output q	Employment e	Productivity p	I/Q
Japan	13.45	5.47	7.98	27.62
West Germany	8.36	3.63	4.73	14.98
Italy	7.93	2.81	5.12	16.93
Australia	6.54	2.31	4.23	15.94
New Zealand	6.30	3.14	3.16	11.65
Denmark	6.30	2.92	3.38	10.07
Netherlands	5.94	1.66	4.28	16.09
France	5.81	1.41	4.40	14.04
Canada	5.24	2.30	2.94	13.52
Austria	5.24	1.20	4.04	14.82
Belgium	4.79	0.63	4.16	14.49
Norway	4.34	0.72	3.62	16.65
United States	3.81	1.06	2.75	13.01
United Kingdom	3.25	0.77	2.48	12.35
	(1)	(2)	(3)	(4)

Summary regression:

$$e = -0.06 + 0.675\,q - 0.135\,I/Q \qquad r^2 = 0.938$$
$$(0.47)\ (0.077)\ (0.049) \qquad n = 12 \quad (2)$$

Sources: All countries other than Australia and New Zealand : Output and Investment: Calculated from constant price data in "O.E.C.D. National Accounts Statistics" (75) and (76). Employment : calculated from data in "Manpower Statistics" (74) and "Labour Force Statistics" (72). Column (3) = column (2) - column (1).

Australia : Calculated from data in Australia Year Book (1), various issues.

New Zealand : Output calculated from data in Appendix Table 7-3. Employment data taken from Gillion and Frankel (23) Table 31 rows 5-29 page 56, and investment data taken from Factory Production Statistics (60), various issues.

(1) For the period covered, see Table 3-2

(2) In the estimation of this summary regression, as in all others presented in this thesis, New Zealand has not been included. The reason for this is that it would be inappropriate to include New Zealand data in the estimation of a relationship with which New Zealand is then compared. In this table, the Australia evidence is also excluded, because in the text the behaviour of Australia too is compared with the general relationship.

output ratio can be seen from the summary regression beneath Table 3-4[1]. This regression equation has been estimated with the rate of growth of manufacturing employment as the dependent variable, to reflect the concern of this chapter with the rate of growth of industrial employment that is associated with the output growth examined in the present section. The equation indicates the systematic tendency for manufacturing employment growth to have been more rapid in those countries where the rate of manufacturing output growth has been high, and the equation further indicates that, for any given rate of output growth, the associated rate of employment growth has characteristically been the lower, the higher has been the value of the investment-output ratio.

This equation ought not to be regarded as representing a fully-specified production relationship. In a sector so large as Manufacturing, not only does the supply of labour affect the level of output, but also the level of output is a determinant of the demand for labour. Over time both these schedules may shift, so that an expression such as the summary equation above at best represents a reduced-form of two complex relationships. Furthermore, as will be discussed below, there are indications that the relationship may not prove to be robust over time. Nevertheless, the equation does represent a convenient statistical summary of the behaviour of output, employment and investment in a number of countries in the 1950's and 1960's, and as such represents a useful yardstick against which the performance of Manufacturing in New Zealand can be assessed.

The equation would predict that, associated with the 6.3% rate of growth of Manufacturing output in New Zealand and the 11.65% investment-output ratio, would be a 2.6% rate of growth of manufacturing employment. The actual rate of growth of employment was 3.1% per year, 0.5 percentage points higher than predicted by international experience. It follows that productivity growth was <u>lower</u> than would be predicted, again by 0.5 percentage points.

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(1) The close statistical relationship between these three variables was first pointed out by Kaldor (42).

Other countries deviate from the regression plane also, as can be seen from Table 3-5 below, although few countries deviate quite as far below as New Zealand does, the amount by which actual employment growth exceeded expected employment growth in New Zealand being comparable in magnitude only with the deviation of Canada. The positive deviations of all the other countries were smaller, so that it would seem that there is a case, although quantitively not an extremely large one, for saying that manufacturing productivity growth in New Zealand was slightly slower than would have been expected from international experience, given the rate of growth of output and the level of investment. Furthermore, the value of the investment-output ratio used in making this calculation, 11.65% is low in international comparison, and there is some reason to believe that this figure, which is estimated by the expenditure method rather than by the sectoral destination of capital goods, is downward-biased - see T.K. McDonald (49). To the extent that this is so, the discrepancy between expected and actual employment growth is underestimated, and hence the amount of the productivity "short-fall" is also underestimated. It is interesting to note that for Australia the rate of growth of employment that would be expected, given the 6.5% growth rate of output and the investment ratio of 15.94% is 2.2%, exactly the same as the actual value . Productivity growth in Australia, therefore, is as rapid as would be expected on international experience This difference between the relative performance of Australia and New Zealand is interesting, particularly because, as will be seen in the next section, the pattern of output growth in New Zealand industry has been very like that in Australia.

Table 3-5 Expected and actual employment growth in Manufacturing, various countries

Country	Employment Growth, % per year		
	Expected e*	Actual e	Residual
Japan	5.29	5.47	0.18
West Germany	3.56	3.63	0.07
Italy	3.01	2.81	-0.20
France	1.97	1.41	-0.56
Denmark	2.83	2.92	0.09
Netherlands	1.78	1.66	-0.12
Canada	1.65	2.30	0.65
Austria	1.48	1.20	-0.28
Norway	0.62	0.72	0.10
U.S.	0.76	1.06	0.30
Belgium	1.22	0.63	-0.59
U.K.	0.47	0.77	0.30
New Zealand	2.62	3.14	0.51
Australia	2.20	2.21	-0.01

Note: e* is calculated from the equation

$$e^* = -0.06 + 0.675q - 0.135\ I/Q$$

values of e, q, and I/Q are taken from Table 3-1.

Over the later period 1967-68 to 1971-72 the behaviour of manufacturing output, employment and investment in a number of European countries exhibited a marked deviation from the relationship discussed above, with the growth of employment being much less than would be expected given the rate of growth of output and the value of investment. Of various hypotheses which seek to explain this phenomenon, two are prominent. The first, advanced by, amongst others, the National Institute of Economic and Social Research[1], is that, in Britain at least, the phenomenon is the result of a "shake-out of labour" brought about by prolonged domestic stagnation, which tends to cause relatively high unit costs and relatively low profits. In terms of this explanation the recent period of rapid labour productivity growth is an essentially cyclical phenomenon, which has recently reached greater proportions than is customary because the recession has been unduly protracted.

The other explanation, put forward by Lundberg (48), also sees declining profit as the stimulus towards economising on labour, but regards the increase in the rate of labour productivity growth as a long-term phenomenon rather than as a cyclical event. The argument is that, as economies become progressively more open to international trade and foreign competition becomes more intense, manufacturers increasingly are faced in their home markets as well as in foreign markets by prices which they cannot exceed if they are to maintain their market share. Pressed by rising wages, manufacturers are therefore forced to find new ways of economising on labour.

Over this latter period New Zealand did not experience any rapid increase in the rate of labour productivity growth in Manufacturing - indded between 1967-68 and 1968-69 labour productivity declined slightly - so that if the European acceleration is a long-term phenomenon brought about by increased foreign competition, the protective effect of import controls in New Zealand may in the future limit the rate of New Zealand labour productivity growth

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(1) See, Worswick, G.D.N. (106).

to a value below that which would have obtained had free trade in manufactures prevailed.

But over the period of the 1950's and 1960's examined in this thesis, there is little evidence to suggest that, given the level of investment, the rate of growth of employment and hence of labour productivity was markedly out of line with international experience. At most the rate of productivity growth was 0.5 percentage points below what it could reasonably be expected to have been, and it is important that productivity growth in Canada, a country which industrialised in a relatively open market rather than behind a protective wall, also deviated as much from the general relationship as New Zealand did, and in the same direction. In later sections of this chapter the structure and scale of New Zealand industry is examined, and possible reasons for New Zealand's slightly low rate of productivity growth in industry are examined.

The structure of industrial growth in New Zealand

In this section, the structure of manufacturing growth in New Zealand is examined, and compared with the structure of manufacturing growth in a number of other countries. The examination is carried out at the most detailed degree of disaggregation at which it is possible to obtain internationally-comparable data, and this is the 2-digit level, data being taken from the U.N. publication "Growth of World Industry", (97) and (98). New Zealand data is available[1] for 16 of the 20 2-digit industries into which manufacturing activity is subdivided, and so in this section all other countries in the world for which at least as much data is available are included for comparison with New Zealand. Most of the countries regularly appear in the other comparative tables throughout this thesis, but in addition to these countries good data is also available for one other country, Finland, which in the interests of obtaining the maximum possible amount of comparative information on a matter where data availability is limited is therefore included also. Finland represents an interesting comparison with New Zealand, for it too has a relatively small population and depends to a relatively large extent on primary production.

It is found that the pattern of New Zealand's post-war industrial growth closely parallels that of Australia, and is also fairly similar to South Africa's. By contrast, the pattern of growth is much less similar to that of the U.S., Canada, and the U.K., and interestingly, is quite dissimilar to that of Norway, Denmark, and Finland.

This can be seen from Table 3-6 which shows the ranking of industry growth rates at the 2-digit SIC level. Underneath the table are given the coefficients of rank correlation of each country with New Zealand.

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(1) The basic source of New Zealand data is the "Factory Production Statistics", (60), and the data is also published in the U.N. "Growth of World Industry" tables (97) and (98).

Table 3-6 Ranking[1] of industry growth rates at 2-digit SIC level, various countries[2]

Industry	DE	Nor	CA	US	UK	Fin.	SA	Austr.	NZ
20 Food	5	12	12	11.5	13	8	13	15	13
21 Beverages	9	11	10.5	11.5	3.5	13	6	12	11
22 Tobacco	15	14	4	14	14	9	16	11	10
23 Textiles	12	16	3	13	15	14	1	10	5
24 Footwear	10	15	14	7	10.5	11	12	13	14
25 Wood products	14	7	16	16	9	15	11	14	15.5
26 Furniture	2	2	10.5	2	12	6	14	9	12
27 Paper	4	9	8	4	3.5	1	2	1	1
28 Printing	11	10	7	8	5	10	4	5	6
29 Leather products	16	13	15	15	16	16	15	16	15.5
30 Rubber pfoducts	13	5	6	5	6	12	9	4	7.5
31 Chemicals	6	4	1	1	1	2	5	3	7.5
33 Non-metallic mineral products	7	6	5	9	7	3	8	7	9
35 Metal products	3	3	9	10	10.5	5	10	6	2
37 Electrical machinery	1	1	2	3	2	4	7	2	3
38 Transport equipment	8	8	13	6	8	7	3	8	4

Coefficient of rank correlation of each country with New Zealand

Australia	0.832
South Africa	0.704
Finland	0.588
Canada	0.580
Denmark	0.482
United States	0.468
United Kingdom	0.453
Norway	0.344

Note: 1. A rank of 1 indicates the most rapidly growing industry.
2. The time periods are given in Footnote 1 to Table 3-7.

Source: See Table 3-7 below.

The correlation is high, and significant at the 1% level, with Australia and South Africa. The correlation is lower, and significant only at the 5% level, with Finland, Canada, the U.S., Denmark and the U.K., and is not significant with Norway. The lower correlation coefficients in these countries reflect the quite substantial relative differences in growth rates that existed in some industries. The actual rates are given in Table 3-7, which shows the considerable differences that exist in the way the industrial structure of the various countries developed over the period of the 1950's and the 1960's.

There have been three manufacturing industries that have grown very fast, not only New Zealand, but also in a number of other countries. The most rapidly growing industry in New Zealand was Paper and Paper products (13.3%), as in Australia (10.7%) and Finland (9.3%). Rapid growth of Paper and Paper products also occurred in South Africa, the U.K., the U.S., and Denmark, but the growth in Norway and Canada was in each case little different from the average growth rate of all the manufacturing industries in the country concerned. The industry in New Zealand consists basically of 6 plants, which produce pulp, some of which is exported to Australia and Japan, the remainder being used for the domestic manufacture of newsprint: other products are kraft and various other types of paper, paperboard, and fibreboard. Some of these finished products are exported, mainly to Australia, indicating that this industry is competitive at the prevailing exchange rate.

The rapid growth of this industry is in large part the result of deliberate Government policy. The industry is based on the Radiata pine, which grows extremely rapidly under the highly suitable New Zealand conditions. A considerable amount of investment in establishing and maintaining very large pine forests was undertaken by the Government through the Forest Service pursuant to the 1949 Forests Act, and financial assistance was also given to establish modern large-scale pulp and paper plants.

Table 3-7 Industry growth rates[1] at 2-digit SIC level, various countries.[2]

Industry	De	Nor	CA	US	UK	Fin.	SA	Austr.	NZ
20 Food	7.0	2.7	4.0	2.9	2.0	5.6	3.7	3.4	3.6
21 Beverages	4.2	3.4	4.2	2.9	4.6	3.6	6.9	4.5	4.3
22 Tobacco	2.6	1.6	5.7	2.5	-0.1	4.9	1.0	4.8	4.6
23 Textiles	2.9	1.3	6.0	2.8	-0.5	3.5	11.1	5.8	8.2
24 Footwear	3.4	1.6	3.3	3.8	2.4	4.4	3.9	4.0	3.0
25 Wood products	2.7	4.5	2.8	0.5	2.5	2.8	4.5	3.7	2.9
26 Furniture	7.9	6.5	4.2	5.6	2.3	6.3	2.4	6.0	4.1 (4)
27 Paper	7.1	4.2	4.4	4.7	4.6	9.3	9.8	10.7	13.3
28 Printing	3.2	3.5	4.6	3.6	4.5	4.8	7.8	6.8	7.0
29 Leather products	0.8	1.7	2.9	1.5	-0.9	-0.7	1.5	0.1	2.9
30 Rubber products	2.8	4.9	4.9	4.5	4.0	4.0	4.7	8.0	6.3
31 Chemicals	5.3	6.1	6.5	7.6	6.4	8.7	7.2	9.1	6.3
33 Non-metallic mineral products	4.4	4.8	5.4	3.5	3.9	7.4	5.0	6.7	6.1
35 Metal products	7.6	6.4	4.3	3.3	2.4	6.9	4.6	6.7	12.2 (4)
37 Electric machinery	12.1	8.5	6.2	4.9	5.8	7.1	6.6	10.6	11.5
38 Transport equipment	4.3	4.4	3.5	4.2	3.0	5.7	8.6	6.0 (3)	8.8

Notes:

1. In this table, growth rates were calculated over as long a post-war period as the availability of data permitted, in order to eliminate short-run effects and to gain as good a picture as possible of the long run structure of growth rates. The end-years were:

   DE 53-64; No 53-64; Ca 53-65; US 53-65; UK 53-65; Fin 54-64; SA 53-64; Australia 53-67; New Zealand 54-65.

2. Growth Rates in this table were calculated by fitting an ordinary least squares trend to annual data, to minimise the chance effect of atypical end years in any industry.

3. Estimated from motor-vehicle production, Australian Year Book (1).

4. For period 1958-1965.

Source: UN Growth of World Industry Tables (97) and (98).

The other two really fast-growing industries in New Zealand have been Metal Products, a term which covers a miscellany of activities such as sheet metal working, wire making, nail making, electroplating, and metal polishing; and Electrical Machinery, which includes mainly the manufacture of electric cookers, other household appliances, radios, and television sets, the growth of television production being responsible for much of the overall growth exhibited by this industry - television sets were not at any stage imported into New Zealand in any quantity. The growth of Metal Products (12.2% per year), was considerably more rapid than in any of the other countries, and was also relatively higher than in all of the countries. The rapid growth of this industry, producing fairly simple products, reflects the relatively immature stage of industrialisation in New Zealand. The electrical goods industry has characteristically grown fast in all the countries except South Africa, which over the period considered did not broadcast television. The electrical industry has been the most rapidly-growing industry in Denmark and Norway, the second-most in Australia, Canada, and the U.K., third-most in the U.S., and fourth in Finland.

All the other industry-groups in New Zealand grew at less than 9% per year. Top of the second group, and fourth overall, was Transport equipment, which is dominated by the production and repair of motor vehicles. Output in this industry grew more rapidly than average in all countries except Denmark (which does not produce motor cars) and Canada (which over the period concerned imported a high proportion of its total requirements), but in New Zealand this industry grew absolutely and relatively faster than in any of the other countries except South Africa.

An industry which grew relatively rapidly only in New Zealand, Canada and South Africa (where it was the fastest-growing industry) was Textiles, which was established in New Zealand in the first instance under tariff

protection and subsequently sustained under quota protection[1].

The remaining industries in New Zealand have output growth rates that again rank particularly closely with Australia, and also with South Africa and Canada. This can be seen from the rank correlations below, which show the extent to which the structure of the industries not so far discussed correlate in each case with New Zealand. The correlation with Australia is particularly striking, having been found for all the industries considered together and for this reduced group, indicating that the similarity of the structural development in New Zealand and Australia is not confined simply to their having a few rapidly-growing industries in common:

	r
Canada	0.86
Australia	0.83
South Africa	0.71
U.K.	0.64
U.S.	0.59
Finland	0.51
Norway	0.42
Denmark	0.26

The structure of industrial growth in New Zealand, even when this reduced group of industries is considered, still differs considerably from that in Denmark and Norway. The important differences are that, relative to Denmark, New Zealand (and, to a large extent, Australia) had slow growth of the food-processing and furniture industries, and fast growth of the Tobacco, Printing, and Rubber industries. Relative to Norway, New Zealand (and, again to a large extent, Australia) had relatively slow growth of Wood Products and Furniture, and relatively rapid growth of Tobacco and Printing.

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(1) This industry and its initial dependence is discussed further below.

It was argued in Chapter 2 that the broad effects of quota restriction, even if imposed primarily for balance of payments reasons, would be broadly similar to the effects of a tariff imposed to protect local industry, and this is consistent with the evidence of the broad similarities in the industrial growth structure in New Zealand and Australia. Indeed, although quotas were imposed in New Zealand primarily, in the first instance, for balance of payments reasons, the protective implications were soon realised, as can be seen from the following passage from Wilson (104):

> "....almost immediately after the inception of import control, discussions were held between the Department of Industries and Commerce and representative groups of manufacturers in a wide range of industries. These discussions were with a view to ascertaining the extent to which those industries could expand in order to save, in the long run, the oversea exchange representing the difference between imports of the necessary extra raw material plus the extra capital-equipment required and the cost of the finished goods which would otherwise have had to be imported."

The similarities of the industrial development in Australia and New Zealand are therefore not wholly surprising. Because of these similarities, however, it is particularly interesting that productivity growth in New Zealand industry apparently was slightly less rapid than in Australia, taking into account differences in the level of investment. This may be due to the fact that quotas in the way that they were administered in New Zealand, encouraged the formation of small-scale operations: it will be seen in the next section that this tends to happen even with a tariff, but that, at least in New Zealand, the tendency was considerably greater under a quota regime.

Commercial policy in Norway, Australia, and New Zealand

A comparison of Norway, which in the post-war period has reduced protection of its manufacturing sector greatly, with Australia and New Zealand, which have protected their industry (one by tariff and the other by quota) is illuminating, for it suggests how commercial policy may affect manufacturing efficiency.

The Norwegian development has been described by Balassa (2). In the period immediately after the second World War Norwegian industry was protected by quotas and a tariff. Initial fears of Swedish competition stopped Norway from joining a Nordic Union, but subsequent policy reversed this general attitude, so that by 1958 quotas had been abolished, and tariffs were low even by the standards of industrial countries. The weighted-average tariff in Norway was 11.7%, compared with 18.2% for the U.K., 16.8% for the U.S., and 14.5% for the E.E.C. as a whole. Furthermore, the degree of protection was more uniform in Norway than in other countries(1). Norway was a founder member of E.F.T.A., which was established in 1959.

When a policy of such liberalisation is pursued, manipulation of the exchange rate is necessary at the time protection is being reduced unless fortuitously the rate together with any changes in the terms of trade turn out to be appropriate for the simultaneous maintenance of internal and external balance. It can also be a period of relatively violent change for the structure of industry, as industries that were relatively highly protected are eliminated or reduced in size and industries that previously received little protection expand, in both foreign and domestic markets, in response to an easier supply of labour and perhaps a more favourable exchange rate.

This is broadly what happened in Norway. An abundance of relatively cheap power led to the production of specialised steel products in electric furnaces, and much of this steel is exported. There has been a tendency for

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(1) Balassa, op. cit., P.350

Norway to specialise in products which require relatively skilled labour, and to import relatively simpler products, such as basic textiles, clothing, and footwear[1].

The commercial policy in New Zealand, as in Australia, was quite different. Protection by a tariff, as in Australia, confers a cost advantage on a great many industries, regardless of the magnitude of demand for their products. Production lines are likely to be set up not only for the manufacture of items demanded in large quantity, but also for items for which the demand is relatively small, thereby establishing the "home-market bias" examined in Chapter 2. Protection by quota may decrease this tendency towards the establishment of small-scale industry, or it may encourage it: the Government decides whether new or existing firms and plant are to be granted licenses to import basic requirements, thereby influencing the rate of growth of new firms to a very large extent. In New Zealand, as will be seen below, the rapid growth of new establishments has been encouraged.

These differences in commercial policy had two important consequences, the first of which concerns manufactured exports. In 1949, Norway exported only 3% of its manufactured output, whereas by 1966 this ratio had risen to 16%[2], with an attendant rise in the proportion of imported manufactures in total absorption of manufactures. Chemicals and engineering products now account for half of manufactured exports, and steel products, ships, electrical machinery, specialist textiles and wood products are also important[2].

The situation in New Zealand was markedly different. In 1963/64, manufactured exports equalled only 3.7% of manufacturing output, and by 1966/67 was only 5.4%[3]. The process of lessening the dependence of the

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(1) Balassa, op. cit. p.354.

(2) Balassa, op. cit. p.355 .

(3) See Lloyd (47).

economy on exports of primary products therefore took place in quite a different manner in New Zealand from Norway: Norway specialised in the production and export of some commodities, whereas New Zealand undertook the manufacture of as many commodities as available resources of labour and imported materials allowed: there was virtually no manufactured commodity that was exported in large quantity, except for newsprint and pulp in later years. In Australia the proportion of manufactured output was less than that of Norway, but greater than in New Zealand(1), which would suggest that while the Australia tariff did exert a home-market bias, the effects were less severe than was the case with the New Zealand quota.

The second major respect in which the effects of commercial policy in the three countries had an important effect, and this is a consequence of the first effect, concerns the scale of operation in manufacturing. The "home-market bias" effect of protection of encouraging the production of commodities required in relatively small quantities led to a fairly rapid rate of growth of new establishments in Australia. In 1958 there were 52,439 manufacturing establishments employing more than one person, and in 1966 there were 59,944(2), a growth rate of establishments of 1.7% per year. In New Zealand over the same period, the effect of protection, combined with the Government's predeliction for new establishments, lead to the number of establishments in New Zealand manufacturing growing at 2.4% per year, from 8,565 to 10,394(3). Norway provides a fascinating contrast, with the number of establishments actually declining, at 0.7% per year, from 18,648 in 1958 to 17,680 in 1966(4).

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(1) In 1965 the value of exports was Australian $m 470, and the value of manufacturing $m 5302, so that exports were 8.9% of production - data taken from the U.N. Yearbook of National Accounts Statistics and the U.N. Yearbook of International Trade Statistics.

(2) U.N. Growth of World Industry Tables, (97) and (98).

(3) 1969 New Zealand Year Book, Statistical Appendix, page 1052.

(4) Norway Central Bureau of Statistics, Historical Statistics 1968 page 207.

This means that if the mean value of output per establishment is taken as 100 in each of the three countries in say 1958[1], the values in 1966 would have been:

New Zealand	136
Australia	146
Norway	155

It follows that manufacturing in New Zealand was less likely to have benefited from economies of scale than was the case for Manufacturing in Australia and Norway. This is not a matter of complete certainty, because it is the scale of plant operation, rather than the scale of establishment operation, that is relevant, but nevertheless the general presumption is strong. Furthermore, there is specific evidence that the scale of production of certain specific products is extremely small in New Zealand, and that scale effects are potentially very important in the manufacture of these products. This is discussed in the next section.

The importance of scale effects in New Zealand manufacturing

Motor car production is an important case in point. In Australia high tariffs protected the newly-established motor-car industry, which was thereby granted unimpeded access to a large portion of a large and growing market. One major firm, a subsidiary of the U.S. firm General Motors, was established. Subsequently the height of the tariff was reduced, and competition for G.M. has resulted, both from imports and new domestic production. The New Zealand case was different. Imports of motor vehicles were restricted by quota, which in this respect conferred the protection on the motor vehicle industry that in Australia was achieved by tariff. By the allocation of licenses to import such basic components as engines, gearboxes, and transmissions, however, the Government effectively determined the number of producers.

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(1) By 1958 most countries had abolished most quantitative trade restrictions, so this is an appropriate date from which to consider the possible effect of alternative trade policies.

Perhaps in the belief that having a large number of producers ensured that production in each firm took place at the point of minimum average cost, the Government allowed seven major firms to be established, ignoring the economies of scale that could have been reaped had only one or two firms produced for the whole market, in the Australian manner.

As can be seen from the last column of Table 3-8 below, the New Zealand output of about 72,000 vehicles would be a fairly small output for one firm, so that it is clearly inefficient to spread production between 7 major firms. As will be seen below, scale effects are extremely important in the motor vehicle industry.

Information on the scale of production of various electrical goods has been published, Sewell (87). 40,000 units of one model of a radio set were produced in New Zealand, whereas a normal series by a European firm would have been 100,000 units (Sewell, p.105). The average series length is much lower than this, at approximately 5,000 units. Sewell also cites the case of a German firm, the largest manufacturer of refrigerators in Europe, which has achieved a series length of 600,000 refrigerators. Leading Italian manufacturers of refrigerators produce series of up to 500,000 units. On the other hand, in New Zealand a typical series length for refrigerators, washing machines, vacuum cleaners, and electric ranges is a great deal smaller, 20,000 to 30,000 units being typical. The number of washing machines produced in New Zealand by the Fisher and Paykel firm was perhaps a New Zealand record at 300,000 units of a particular model of wringer washing machine, produced over a period of about 25 years. Series of 1,000 to 2,000 units are common in the production of other electric household goods.

Furthermore, these production runs are often not undertaken in one continuous operation; as in the case of the wringer washing machines, production often takes place over many years, in batches, with the labour force and some of the capital stock producing other goods in the intervals.

Table 3-8 Motor vehicle production, various countries, 1965

Country	National production x 10^3	Number of firms accounting for 80% to 90% of production	Average Production of these firms, x 10^3
Italy	1158	1	988
Germany	3056	4	649
France	1582	4	383
U.K.	2135	4	498
Japan	1871	8	211
Brazil	181	3	54
Spain	213	3	60
Argentina	197	5	34
Mexico	127	6	19
India	70	5	11
Venezuela	54	6	8
New Zealand	72	7	8

Source: World Bank Report on the New Zealand economy (105) p.107

Scale effects are important in all these industries, and take several forms. The length of the production run, which as has been seen is frequently extremely short in New Zealand, and the size of plant both have a large effect on unit costs. There are many reasons why this is so, but two particularly important reasons can be distinguished.

In the construction of capital equipment, the so-called 'power rule' is often operative: where the equipment is volumetric, for example a sphere, the relationship between the area of material used to make the sphere and the volume it encloses is

$$A = fV^{2/3}$$

Cost being approximately proportional to the area of material used, it follows that cost too varies as volume to the 2/3 power, so that a 10% increase in capacity requires only a 6.5% increase in expenditure. The same phenomenon, with different coefficients, applies to other vessels.

Series length affects unit costs a great deal through the mechanism of learning by doing: Sewell states that assembly of electronic products in New Zealand is much slower than on identical assemply lines in Europe, not because New Zealand labour is in any way inferior, but because of the relative unfamiliarity that the workers have of their process compared with their European counterparts.(1)

The motor car industry offers tremendous potential gains from scale effects. These have been investigated by Maxcy and Silberston (52), and more recently by Pratten (79). An Australian example of the magnitude of scale effects in this industry was given by Maxcy in Hunter (35) for the cost of producing a major mechanical component for a motor car:-

see Table 3-9 below.

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(1) Sewell, op. cit, p. 118

Table 3-9 Total capital cost by series length for the production of a major motor-car-component

Series length, units per year.	Total capital cost, index.	Percentage increase in capital cost
25,000	100	-
50,000	135	35
100,000	205	52
200,000	400	95

Source: Sewell (87) page 116.

The potential importance of such scale effects in New Zealand was investigated in a study of the New Zealand motor car industry by Rose (82), who concluded that

> "... an industry comprising two plants of equal size, and assembling in total the same number of cars as the whole industry does today, might well achieve average unit operating costs as much as 20% below those of the industry today."

The following estimates of the influence of series length on unit costs were given by Sewell[1] for three basic manufacturing processes in New Zealand: the potential economies of scale are large.

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(1) Op. cit.

Table 3-10 The influence of series-length on unit costs in three manufacturing processes: N.Z. data

Series (no.. of units.) $x10^3$	Plastic Cabinet A	Plastic Cabinet B	Metalware	Other Plastic Components.
5	100.0	100.0	100.0	100.0
10	86.3	58.6	62.5	61.1
25	57.3	34.4	44.0	41.2
50	52.4	26.0	32.6	31.8
100	49.4	21.8	26.9	27.7
250	49.1	19.0	23.1	24.5
500	48.8	18.8	22.0	23.9
1,000	48.8	18.4	21.4	23.4

Source: Sewell (87).

Pratten (79) has also demonstrated the importance of economies of scale in the manufacture of such products as beer, bread, soap and detergents, chemicals, bicycles, cotton textiles and footwear, all of which are important industries in New Zealand, and Griliches and Ringstad (26) have produced comprehensive production-function evidence of the existence of increasing returns to scale at the 2-digit level in Manufacturing in Norway. By encouraging broad-based industrialisation, through the general effects of protection and the specific agency of quotas, the Government in New Zealand has certainly imposed a cost on the economy by not taking advantage of the large economies of scale that are available if production for home consumption and export is concentrated in fewer commodities produced in larger quantities.

It does not however necessarily follow from this that the policy was wholly ill-conceived; for it is likely that the New Zealand economy, with its relatively broadly-based manufacturing sector, is less vulnerable to fluctuations in world demand for certain manufactured products than is the case in Norway. Furthermore, the maintenance of continuous full employment,with no losses incurred from deflation indulged into secure external balance, has been an offsetting factor of control by quota. In the next section, two further important consequences of the existence of increasing returns to scale are examined.

The existence of excess capacity in New Zealand

The first of the two consequences of increasing returns to scale in New Zealand was the existence of a large amount of excess capacity in the early 1950's, which has been partially eliminated in subsequent years. Estimates of capacity utilisation are hard to make, and usually involve inference, but one direct method has been developed by Foss, (20); and it is in some respects peculiarly suited to the New Zealand situation. From data on the rate of growth of the installed horsepower of electric motors used to drive machinery, and from information about the amount of electricity consumed by those motors, it is a direct calculation to determine the number of hours per year for which the motors, and hence the machinery they drive, were operating. This method is particularly suited in principle to the New Zealand situation, where over 95% of motive power in factories is provided by electric motors.

The evidence is not sufficiently good to be regarded as completely conclusive[1], but it does suggest strongly that utilisation of capacity in

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(1) See Appendix 2-1 for the application of the method to New Zealand, with details of the assumptions that have to be made.

the manufacturing sector has been increasing at about 4% per year. This is quite a high rate, and was made possible at least in part by the extremely low level of utilisation prevailing in the early 1950's: the level of utilisation in 1951 was no more than 45% of a full 40-hour week, compared with over 80% in the U.S. in the 1950's.

There are various reasons why excess capacity should have developed in New Zealand in the 1950's. In the first place, some newly-protected industries took labour away from older, non-protected, industries, so that the capital equipment of some established industries was left idle. An example of this is in the textile industry, about which Wilson (104) wrote:

> "...the long-established and desirable woollen-mill industry (based on indigenous raw material) is unable to meet the local demand for such items as blankets. And, furthermore, in regard to the same industry, the case has been publicized of one woollen-mill which, because of acute labour shortages, has had to import, for a subsidiary clothing-factory, cloth for which the woollen-mill has all the necessary plant."

As the demand for the products of the newly-established industries becomes satisfied, and as more employees enter the labour force, it is likely that the older firms which suffered after the initial imposition of quotas would be able to re-commence operation. But a second and very important reason for the installation of excess capacity lies in the existence of the increasing capacity returns to scale.

The more rapidly that demand is expected to grow, the more excess capacity it pays a producer to install, because of the shorter time it will be before the excess capacity, with its low marginal cost of purchase, will start producing output. Elegant proofs of this proposition are given by Manne and by Srnivasan (51). In the early days after the imposition of quotas, the rate of growth envisaged by some producers would have been extremely high, with virtually the whole domestic market available to them. Under these circumstances, and with the lowering of the price of capital

goods relative to the price of consumption goods, referred to in Chapter 2, it is to be expected that a great number of firms would install excess capacity.

The second consequence of the existence of economies of scale

The phenomenon of increasing returns to scale makes it extremely hard to estimate the rate of growth of capacity in the manufacturing sector. Most estimates of the capital stock are made by the perpetual inventory method, whereby the constant price cost of investment in each period is added to the cumulated sum of investment, a deduction then being made for depreciation. This is the method pioneered by Goldsmith (25) and adopted for New Zealand by Francis (21). It is essentially a financial measure, indicating the constant price cost of resources devoted to capital formation.

It has become a common practice, following Solow (89) however, to use a perpetual-inventory series of capital stock as if it were a series of capital capacity. This is invalid, however, to the extent that plant installed in successive years is progressively larger, and the underestimate could be large[(1)]. Furthermore, to the extent that improvements in the quality of capital goods are not allowed for when the exercise of converting current prices to constant prices is carried out, the measured rate of growth of the capital stock will be an underestimate of the true rate. Suppose that expenditure and capacity resulting from that expenditure are related by a functional relationship of the following form:

$$E = a\,C^{0.7}$$

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(1) Solow was well aware of the heroic assumption he was making: this is shown by the statement "...The capital time series is the one that will really drive a purist mad...ideally what one would like to measure is the annual flow of capital services. Instead one must be content with a less utopian estimate of the stock of capital goods in existence."

which is an expression frequently used in calculating the magnitude of scale economies - see for example Manne (51). If two different levels of expenditure on plant for making a particular product are being compared, it follows that

$$E_2/E_1 = (C_2/C_1)^{0.7}$$

making capacity the subject of the equation gives

$$C_2/C_1 = (E_2/E_1)^{1/0.7} = (E_2/E_1)^{1.4}$$

The rate of growth of net real expenditure on capital in New Zealand over the period 1954/55 to 1965/66 has been estimated by the perpetual inventory method by Francis (21) at 6.8% per year. If the manufacturing sector was producing at the end of the period only those types of good that it had been producing at the beginning, this production could have been carried out in progressively larger plants. It follows from this special limiting case that the rate of growth of capacity would have been greater than 6.8% by a full 3 percentage points, for

$$C_2/C_1 = (1.068)^{1.4} = 1.098.$$

This growth rate of 9.8% per year, 3.0 percentage points higher than the rate of growth of real expenditure on capital equipment, represents the probable upper limit to the rate of growth of capacity: the actual value is likely to lie within the range 6.8% to 9.8%. But the calculation shows not only the potential importance of scale effects, but also one of the reasons why fitted production functions using perpetual-inventory capital stock series characteristically have such a large residual unexplained element.

By the same argument, the coeffieient estimated on the investment-output ratio term used in the cross-country manufacturing employment equation in

the first part of this chapter is subject to estimation error, although the error is non-uniform between countries only to the extent that the average scale of plant has been increasing at different rates in the various countries.

The growth of employment and productivity in Mining and Public Utilities

The rate of growth of employment and productivity in the rest of the industrial activities other than manufacturing remains to be considered.

The rate of growth of labour productivity in Mining in many European countries is influenced considerably by the rate at which Governments have been prepared, on social considerations, to close down relatively inefficient coal pits. In Belgium, the United Kingdom and Germany, for example, productivity grew at less than 2% per year, whereas in New Zealand, which as was seen above experienced a rapid growth in demand for mined road material, employment declined only slowly and productivity grew at 4.8% per year[(1)]. As can be seen from Table 3-11 below, this rate was exceeded only by Japan, Italy, Canada, and Norway. The rate of growth of labour productivity is also, of course, influenced by the rate of capital accumulation, but international data on capital formation in Mining is relatively sparse, and is quite inadequate for New Zealand.

In Public Utilities a study of output per man is of relatively little value because this sector which employs a very small fraction[(2)] of the total labour force, is extremely capital-intensive[(3)], and the rate of growth of labour productivity is likely to be almost entirely a function of the rate of increase of capital intensity, on which evidence is weak. In international comparison the New Zealand rate of 5.4%[(4)] is about average, being exceeded by Japan, [illegible], France, Canada, and Norway - see Table 3-11 .

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(1) In Mining output grew at 4.0% per year, and employment declined at 0.8% per year (these rates are calculated from data in Appendix Tables 2 and 3 to Chapter 7), so that productivity grew at 4.8% per year.

(2) 1.3%: see Appendix Table 2 to Chapter 7.

(3) This fact is shown indirectly by the fact that, in New Zealand in 1965/66, for example, output per man in this sector was about 80% higher than in Manufacturing - this value is derived from data in Appendix Tables 2 and 3 to Chapter 7.

(4) In Public Utilities output grew at 8.1% per year (see Chapter 2) and employment grew at 2.7% per year (derived from data in Appendix Table 2 to Chapter 7).

Table 3-11 The rate of growth of labour productivity in Mining and Public Utilities, various countries

Country	Period	Rate of growth of labour productivity, Z per year.	
		Mining	Public Utilities
Japan	1953-1964	7.4	6.6
West Germany	1951-1965	1.9	4.5
Italy	1951-1963	6.4	4.8
France	1951-1964	4.0	8.5
Canada	1951-1966	8.9	5.8
Austria	1951-1966	N.A.	4.6
New Zealand	1954/55+1965/66	4.8	5.4
United Kingdom	1951-1965	1.4	4.4
Norway	1951-1965	5.2	5.9
Belgium	1951-1964	2.5	5.2
United States	1951-1966	4.6	5.4

Sources: New Zealand: Growth rates of output and employment calculated for data in Appendix Tables 2 and 3 to Chapter 7.

All other countries: Growth rates of output and employment calculated from data in National Accounts of O.E.C.D. countries (75), Manpower Statistics (74), and Labour Force Statistics (72).

Employment and productivity growth in Construction.

Employment in Construction in New Zealand grew at 1.8% per year[1] which, given the 4.1% rate of growth of output examined in Chapter 2, means that labour productivity grew at 2.3% per year. An examination of the international data in Table 3-12 shows that in Construction, as in Manufacturing, there is a strong tendency for employment growth to be more rapid in those countries where the rate of growth of output is higher. The summary equation beneath the table would imply that on international experience a 2.3% rate of growth of employment would be associated with the 4.1% rate of growth of output. The actual rate of employment growth was 1.8%, so that the rate of growth of productivity is 0.5 percentage points higher than would be expected on the basis of this equation. This contrasts with the finding for Manufacturing, where the rate of growth of productivity was 0.5 percentage points lower than expected. It must be emphasised, however, that the Construction equation is less well determined than the Manufacturing equation, and, because of lack of data, does not allow for the differential effects of investment in different countries.

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(1) Calculated from data in Appendix Table 2 to Chapter 7.

Table 3-12 The rate of growth of employment, output, and productivity in Construction in various countries

Country	Period	Rate of growth, % per year		
		Employment	Output	Productivity
		e	q	p
Japan	1953-1964	5.1	14.4	9.2
West Germany	1951-1965	2.9	7.0	4.1
Italy	1951-1963	5.0	8.5	3.5
France	1951-1964	3.3	6.8	3.5
Canada	1951-1966	2.9	6.1	3.2
Austria	1951-1966	2.0	5.0	3.0
New Zealand	1954-1965	1.8	4.1	2.3
United Kingdom	1951-1965	1.8	3.6	1.9
Norway	1951-1965	1.1	2.9	0.8
Belgium	1951-1964	2.3	2.9	0.6
United States	1951-1966	1.7	2.1	0.4
		(1)	(2)	(3)

Summary regression:

$$e_{construction} = \underset{(0.36)}{0.9} + \underset{(0.053)}{0.3349}\, q \qquad r^2 = 0.830, \quad n = 10$$

Source: Output: Table 5, Chapter 2.

Employment: New Zealand: Calculated from data in Appendix Table 2 to Chapter 7. All other countries: calculated from data in Manpower Statistics (74) and Labour Force Statistics (72).

Column (3) = Column (2) - Column (1).

CONCLUSION

The conclusion of this chapter is that, while on world standards manufacturing output grew rapidly in New Zealand, the growth of productivity was somewhat less than would have been expected. At least in part this was probably due to the fragmentation of broad-based production into a large number of small-scale units. The industrialisation, in which specialisation was eschewed in favour of production of a wide range of commodities, has assumed a broadly similar structure to that in Australia, and to a certain extent Canada and South Africa as well. The New Zealand experience contrasts markedly with that of Norway. A significant amount of excess capacity still exists in the New Zealand manufacturing sector, and it is therefore possible that future growth of output may be able to take place with somewhat less investment than would otherwise be expected. The rate of productivity growth in Mining, Public Utilities and Construction was, taken over all, a little higher than average. The purpose of the next chapter is to examine the rate of growth of output and productivity in Agriculture.

APPENDIX 3-1

The application of the Foss method to the manufacturing sector

Information on the electricity consumed by electric motors is typically not obtainable directly. Foss (20), and later Jorgensen and Griliches (41), establish manufacturing electricity consumption by dividing total manufacturing sector expenditure on electricity by the cost per kilowatt-hour to get real consumption in KwH. This figure is then multiplied by the fraction of total manufacturing electricity consumption that is due to electric motors, this fraction having been determined by sample survey. Unfortunately, no such sample survey has been carried out for New Zealand, and so it has to be assumed that the ratio of electricity consumed by motors to total manufacturing electricity consumption has been constant.

Whether or not this assumption is legitimate will have to remain the subject of conjecture until some form of survey is carried out: motors are not metered separately from other industrial uses of electricity in New Zealand. The argument in favour of the assumption rests on the fact that the other major uses of electricity by industry are heating and lighting. It seems likely that lighting stays virtually constant as a proportion of total expenditure, but that some movement away from electric heating towards oil heating might have taken place, in which case the proportion of total electricity consumption that is due to motors will have risen somewhat. This will lead to a downward bias in the estimation of the growth rate of electricity consumed by electric motors. This matter is referred to again below.

A consequence of the constant-motor-fraction assumption is that the absolute level of utilisation cannot be established precisely, but provided that the assumption is correct, changes in utilisation can be determined, and it is these changes that are required for growth analysis.

The results of the calculation are given below in Appendix Table 3-1. In summary, aggregate consumption of electricity in real terms increased over the period at an average rate of 10.7% per year. Total installed horsepower increased at an average rate of 7.1% per year. This means that, subject to various qualifications that are discussed below, the utilisation of the electric motors in the manufacturing industries has been increasing at an average rate of 3.6% per year.

This seems high. It raises the question whether the level of utilisation claimed for the end of the period, 1964, is implausibly high, or whether the level for 1951 was, by international standards, unusually low.

As was seen above, the absolute level of utilisation of electric motors cannot be established for the manufacturing industries, because the proportion of total manufacturing electricity consumption that is due to electric motors is not known. An upper limit for the absolute level of utilisation can be established, however, by assuming that all of the electricity consumed is consumed by electric motors. The calculations shown below determine the upper absolute levels of utilisation as 10.8% or 0.45 equivalent 40-hour weeks in 1951, and 16.8%, or 0.71 equivalent 40-hour weeks in 1964.

Appendix Table A-3-1 The rate of growth of utilisation of electric motors, manufacturing industry, 1951 to 1964

Year	Exp.	Price/KwH	KwH	kwh	hp.
	1	2	3	4	5
1951	3.164	.839	3.771	-	-
1952	3.348	.866	3.866	2.5	5.7
1953	4.544	1.122	4.050	4.8	6.7
1954	5.574	1.161	4.801	18.5	5.8
1955	6.744	1.136	5.937	23.7	16.3
1956	7.050	1.109	6.357	7.1	3.4
1957	8.472	1.110	7.632	20.1	4.7
1958	10.654	1.466	7.267	4.8	5.6
1959	11.576	1.452	7.972	9.7	5.9
1960	12.444	1.420	8.763	9.9	7.5
1961	13.492	1.422	9.488	8.3	10.4
1962	15.264	1.398	10.918	15.1	8.1
1963	15.654	1.360	11.510	5.4	5.2
1964	18.256	1.337	13.654	18.6	7.5
			MEANS	10.7	7.1

Notes: Column 1 is expenditure by the manufacturing sector on electricity, $ x 10^6, current prices.

Column 2 is the electricity price index for the manufacturing sector, cents per KwH.

Column 3 is real electricity consumption, manufacturing sector, KwH x 10^8.

Column 4 is the rate of growth of column 3.

Column 5 is the rate of growth of installed horsepower.

Sources:

Column 1: New Zealand Year Book, various years.
Column 2: New Zealand Electricity Department.
Column 3: Column 1 / column 2.
Column 4: From column 3.
Column 5: From data on installed horsepower of electric motors in the manufacturing sector, New Zealand Year Book, various years.

Appendix Table 3-2 Calculation of upper absolute levels of industrial motor utilisation, end period years.

	1951	1964
1. Horsepower of electric motors	4.82×10^5	11.18×10^5
2. Available KwH of motors (line 1 multiplied by 7,261)	3.48×10^9	8.12×10^9
3. Power consumed, all manufacturing purposes, KwH	3.77×10^8	13.65×10^8
4. Hence per cent utilisation (line 3 divided by line 2)	10.8	16.8
5. Number of equivalent 40-hour weeks (line 4 x 4.2/100)	0.45	0.71

Notes:

Line 2: Following Foss (20), the adjustment is derived as follows: "....each electric motor could work continuously throughout the year ....8.760...horsepower hours are converted to KwH;..... 1 horsepover = 0.747KwH. The result (is) adjusted upward by dividing through by 0.9, since modern electric motors have an efficiency of approximately 90%..."
Foss, op. cit, page 11.

8760 x 0.746 / 0.9 = 7,261

Line 5: There are 4.2 40-hour shifts in a full week of 168 hours.

Sources:

Column 1: New Zealand Year Book, various years.

Column 2: from line 1.

Column 3: New Zealand Year Book, appropriate years, corrected for price changes: see Table 4-5

Given that the upper limit for 1964 was an average utilisation rate of 0.71 of a 40-hour week, or 28 hours, the actual value probably lay within the range 0.5 to 0.6, on the following reasoning. The proportion of total manufacturing electricity consumption in the U.S. is approximately 65% to electric motors and 45% to heating and lighting (Foss). Assuming this to hold for New Zealand also, the actual level of utilisation would be 0.71 x 0.65 = 0.46, or 18 hours per week. It is possible that in New Zealand, where factories would require less winter heating and summer air-conditioning than in the U.S. the proportion would be nearer 0.85, in which case the actual level of utilisation would be 0.71 x 0.85 = 0.60, or 24 hours per week.

These 1964 values of 0.4 to 0.5 are not implausibly high on U.S. standards:

Appendix Table A-3-3	Level of utilisation in equivalent 40-hour weeks			
	1929	1939	1954	1964
United States	0.67	0.64	0.88	-
New Zealand, upper limit	-	-	0.45	0.63
New Zealand, probable range	-	-	.3 to .4	.5 to .6

Source of U.S. figures: Foss (20)

It follows from the fact that the 1964 probable range (and indeed even the upper limit) is not implausibly high that the level of utilisation in the early 1950's must have been low. A similar exercise to that undertaken for 1964 above indicates that the probable range for 1954 was 0.3 to 0.4, that is, 12 to 16 hours per week. The upper limit for 1954 was 0.45, or 18 hours per week. These values <u>are</u> low on U.S. standards.

The major problem in the application of the Foss method to the New Zealand is that the motor fraction is unknown - this has already been referred to. It was argued above that the likelihood is that the likely consequence

of assuming the fraction to be constant would be un underestimation of the rate of growth of utilisation, but of course in the absence of information this assertion is open to challenge. It is of interest to note, however, that the contrary assertion, namely that the observed rate of increase in utilisation is spurious and due solely to a change in the motor fraction, is a strong one. The consequences of this alternative hypothesis are as follows:

Hypothesis:	Utilisation has remained unchanged.
	Now calculated utilisation in 1951 was 11.5%, and the 1965 value was 17.8%
Assume:	that the motor fraction in 1951 was, for the sake of argument, 0.5 (this is an arbitrary figure.)
Hence:	if in fact the utilisation rate remained unchanged, the motor fraction must have altered, to a value given by

$$MF = \frac{17.8 \times 0.5}{11.5} = 0.3$$

This is implausible: contrary to the arguments advanced about the likely increase in the motor fraction, it is necessary for the fraction to have fallen by a full 20 percentage points, that is the proportion of electricity consumed by heating and lighting to have risen by a full 20 percentage points, for the assertion that the utilisation of motors is constant to be validated. This seems highly unlikely.

Denison points out that apparent changes in the utilisation rate can occur because of a changing composition of output. If relatively more output is produced over time in the industries that have higher rates of utilisation, an index of utilisation for the sector in aggregate will show spurious increase, While this hypothesis is inherently testable, it is unfortunately not in the case of New Zealand at present because, for the reasons discussed above, the absolute level of utilisation cannot be determined.

The growth of output, employment, and labour productivity in the Agricultural Sector

As was shown in Chapter 1, the agricultural sector in New Zealand is relatively larger than in other high-per-capita income countries, providing approximately one fifth of G.D.P., and so Agriculture is an important determinant of the overall rate of growth of the economy.

It can be seen from Table 4-1 that nearly all of the output of the agricultural sector is Farming, both Forrestry and Fishing being relatively small. Over the period 1954/55 to 1965/66 the volume of output of the agricultural sector grew quite smoothly, 1963 being the only year of decline, and even this, 1.1%, being quite moderate. The overall rate of growth was 3.6% per year. Farmers' incomes, however, fluctuated considerably over the period, and the important consequences of this phenomenon are investigated in detail later in this chapter.

Table 4-1 The value of G.D.P. originating in Agriculture, Forrestry, and Fishing, constant 1954/55 prices

	Farming	Forrestry	Fishing	Total
1954/55	388	15	6	409
1955/56	395	16	6	417
1956/57	406	16	6	428
1957/58	432	17	7	456
1958/59	453	17	7	477
1959/60	463	19	7	489
1960/61	481	20	7	508
1961/62	490	20	7	517
1962/63	539	19	7	565
1963/64	531	20	8	559
1964/65	542	22	8	572
1965/66	580	23	8	611

Source: Base (1954/55) year values multiplied by official indexes of the volume of production, 1965 New Zealand Year Book (67) page 388. The base-year values are taken from Appendix Table 7-3 to Chapter 7.

Historically a large proportion of total agricultural output has been exported - see Table 4-2 below. The most important product-groups are dairy products, wool, mutton and lamb, and beef.

Table 4-2 Proportion of domestic and foreign consumption of New Zealand agricultural output

Gross agricultural output %	1941-2 to 1945-6	1946-7 to 1950-1	1951-2 to 1955-6	1956-7 to 1960-1	1961-2 to 1965-6
Exported	67	71	70	68	66
Consumed domestically	33	29	30	32	34

Source: 1969 New Zealand Year Book, (67), p.404

The bulk of the basic product of the dairy industry, butterfat, is used for making butter, a substantial part of the remainder being used in the manufacture of cheese. The New Zealand dairy industry has played an important part in world trade: in 1963, for example, while there were 11 countries with larger dairy herds, New Zealand was the fifth largest producer of butter and the largest exporter. In the production of cheese New Zealand ranked tenth, and second in exports.

Jersey cows are the predominant breed, because they produce a higher butterfat yield than most others and are better able to withstand the temperatures of the warmer parts of New Zealand. Most of the butterfat is produced on specialised dairy farms, on which the cattle are pasture-fed for the most part, although hay and silage are used in times of shortage. In contrast with European dairy farming, very little grain or other concentrate feeding takes place because grass grows virtually the whole year round, and cattle do not have to be stalled in winter. This represents a considerable cost-saving compared with the European situation, where at the peak of winter

feeding, the value of the weight put on by beef cattle can be offset completely by the cost of purchased feed.

The development of refrigerated cargo-handling led after 1880 to frozen mutton and lamb being exported to Britain, and breeding policy was deliberately changed from wool production alone to wool plus meat production. There is now considerable interdependence between the two. The bulk of the wool produced is 'cross-bred', a coarse wool particularly suitable for carpet manufacture and less appropriate for clothing. New Zealand produces more cross-bred wool than any other country, and is followed by Argentina and Uruguay. Approximately 97% of the wool is exported, mainly to Britain, France and the United States of America.

Table 4-3 The price of beef in New Zealand relative to various other countries, 1955 and 1966

Price of beef in New Zealand relative to price of beef in:	Year	
	1955	1967
United States	0.398	0.480
U.K. (Argentinian sides)	0.560	0.695
U.K. (English longsides)	0.477	0.563
France	0.463	0.374
South Africa	0.833	0.681
Australia	1.076	0.691

Note: Original prices were converted into U.S. currency at prevailing exchange rates, and were expressed as U.S. cents per kilogram. Data refers to slaughter weight price of beef cattle.

Source: F.A.O. Production Yearbook, (19), Table 206, page 587

Most of the beef production is from specialised beef cattle, although mixed breeds, which produce both beef and milk, are important also. Beef production in New Zealand has differed to date from beef farming in most other countries by being undertaken extensively only in areas unsuitable for sheep, the primary purpose of beef cattle being the control of pasture for sheep production. Production of beef in New Zealand as an adjunct to sheep production rather than a large-scale competitor is in large part a reflection of the fact that New Zealand was denied access to major countries such as France and the United States of America where the price of beef was more than twice the price of beef in New Zealand; see Table 4-3. In Britain, the only substantial foreign market to which New Zealand had access, Argentinian beef was also admitted.

The growth of agricultural output

Agricultural output grew more rapidly in New Zealand than in any of the other countries examined throughout this thesis except Japan. From column 1 of Table 4-4 below it can be seen that Agriculture in Japan grew at 4.4% per year, whilst the New Zealand rate was 3.7%(1). New Zealand's growth exceeded that of the next most rapidly growing country, Belgium, by nearly a whole percentage point, and was 1.7 points greater than the mean. Given that in all countries the area of land under cultivation varied little, the growth of Agriculture shown in Table 4-4 is also approximately equal to the rate of growth of output per hectare.

Thus both industry (examined in the previous chapter) and Agriculture grew rapidly in New Zealand. The weighted mean rate of growth of Industry and Agriculture, 5.1% per year, was the fifth highest of all the countries considered. This can be seen in the last column of Table 4-4 below, in which the growth rates of Industrial and Agricultural output have been combined(2).

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(1) Derived from data in Appendix Table 3 to Chapter 7.

(2) Using 1963 weights in the case of O.E.C.D. countries, 1954 weights in the case of New Zealand, and 1958 weights in the case of Australia.

Industrial and Agricultural output combined grew most rapidly in Japan, followed by West Germany, Italy, the Netherlands and then New Zealand. The overall ranking is very similar to that where Industry alone is considered (see Chapter 3).

Just as it was shown in Chapter 3 that manufacturing and general industrial productivity growth in New Zealand was slightly below average, so too in Agriculture was the rate of growth of productivity somewhat low in international comparison. This is examined in the next section.

Table 4-4 The rate of growth of Agriculture [1] and Manufacturing in various countries [2]

Country	Agriculture		Manufacturing		Agriculture + Manufacturing
	Growth rate % per year (1)	Weight[3] % (2)	Growth rate % per year (3)	Weight[3] % (4)	Growth rate % per year (5)
Japan	4.4	22.4	13.5	28.4	9.4
Germany	1.6	8.7	8.4	46.0	7.3
Italy	2.4	20.7	7.9	32.9	5.8
Netherlands	2.2	12.2	5.9	37.1	5.1
New Zealand	3.6	20.7	6.3	21.6	5.0
France	1.9	11.9	5.8	43.0	4.9
Denmark	1.0	20.7	6.3	38.8	4.5
Canada	1.8	8.9	5.2	34.3	4.4
Belgium	2.8	8.1	4.8	35.1	4.4
Austria	0.7	16.7	5.2	47.1	4.1
U.S.	1.3	5.4	3.8	33.4	3.4
U.K.	2.5	5.0	3.3	41.5	3.2
Norway	-0.1	13.9	4.3	35.9	3.0

Notes: 1. Including Forestry and Fishing.
2. Growth rates were calculated over the years used for each country throughout - see Table 1 in the introduction.
3. 1954 weights.

Source:

New Zealand: Manufacturing - see Table 2-1.
Agriculture - Volume of production index, 1969 N.Z. Year Book page 388.

All other countries: National Accounts of O.E.C.D. countries (75).

The growth of agricultural productivity

Over the post-war period output and productivity growth in Agriculture in most developed countries has been rapid by historical standards[1]. The particularly interesting feature of recent agricultural growth in industrial countries has been that the rate of decline in employment has been relatively uniform. Agricultural employment in all the O.E.C.D. countries examined throughout this thesis declined at between 2.5% and 3.6% per year (see Table 4-5, column 2). Despite the similarity in the rate of decline of employment in the various countries, however, there has been considerable variation in the rate at which output has grown (varying from 4.4% per year in Japan down to -0.1% per year in Norway), which is apparently not accounted for by variations in the level of investment - this can be seen from the data in Table 4-5 and the summary regression beneath.

This is in marked contrast to industry, where the level of investment apparently has had a marked influence on the association between the rate of growth of employment and the rate of growth of output. The absence of any detectable influence of investment is unfortunate, because it means there is no convenient international 'yardstick' with which to compare the New Zealand performance. Furthermore the absence of any such relationship is a phenomenon which needs to be explained.

There are two important possible explanations for the lack of association between output growth, employment growth and investment. The first is that the rate at which organisational change has been encouraged to take place has varied between the various European countries, and the second is there is considerable difficulty of defining satisfactorily enough for international comparison what constitutes investment expenditure and what constitutes the purchase of current inputs. These two problems are considered in the next two sections, in which the New Zealand experience is contrasted with that of European countries.

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(1) See Hayami and Rutton (3)) page 27 et. seq.

Table 4-5 Growth rates (1) of Agricultural output, employment and productivity, and the level of agricultural investment, 13 countries

Country	Growth rate, % per year			Investment-output ratio
	Output q (1)	Employment e (2)	Productivity p (3)	I/Q (4)
Japan	4.4	-2.8	7.2	13.33
New Zealand	3.6	-0.2	3.8	(25.8)
Belgium	2.8	-2.8	5.6	12.8
U.K.	2.5	-2.5	5.0	15.0
Italy	2.4	-2.7	5.0	14.3
Netherlands	2.2	-2.7	4.9	10.7
France	1.9	-3.6	5.5	14.2
Canada	1.8	-3.5	5.3	27.1
Germany	1.6	-3.5	5.1	23.3
U.S.	1.3	-3.6	4.9	23.0
Denmark	1.0	-3.0	4.0	12.6
Austria	0.7	-3.3	4.1	15.2
Norway	-0.1	-3.2	3.1	25.5

Summary regression :

$$e = -2.6 + 0.085q - 0.037\ I/Q \qquad R^2 = 0.466$$
$$(0.5)\ (0.096)\ (0.019)$$

Note: 1. Growth Rates were calculated over the years used for each country throughout - see Table 1 in the Introduction.

Sources: New Zealand : Output - see Table 4-1
Employment - Gillion and Frankel (23) page 50.
Investment - Farming only from Philpott (77).

The process of organisational change in Agriculture

There is in many European countries great potential for expanding output per person employed in Agriculture by increasing the size of farms. The nature of farming is such that adjacent farms frequently produce, or are capable of producing, the same type of output. In contrast with industry, where the take-over of one firm by another usually leads to the amalgamation of much of the total capital and labour only after a considerable length of time has elapsed, in Agriculture the removal of fences is frequently essentially all that is required to increase the scale of operation in many areas of Europe. This can result in very large economies of scale being enjoyed, with consequent reduction in the quantity of factor and sometimes current inputs per unit of output. In Europe where farm size is small and labour density high by comparison with many other countries, economies of scale can be exploited while remaining within the confines of existing technical knowledge. But economies of scale can also be exploited in the United States, where labour productivity is extremely high and labour density is fairly low, as has been shown by Krause and Kyle (46)[1], although some United States examples have been obtained by simulation rather than from actual experience[2].

One incentive to indulge in larger-scale operation is the desire to increase total profit on the part of expansion-minded farmers. This tendency can be reinforced by the trend movement of costs and prices experienced by farmers. In all industrial countries there is a strong tendency for money wages in Agriculture to move upwards in line with the increase in industrial wages - this can be seen from the data in Table 4-6 and the summary regression below. Only in two countries, the Netherlands and the United Kingdom, did wages in Agriculture increase at a lower rate than in manufacturing, and the difference in the two rates of growth was of the order

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(1) Especially Table 3, page 755.

(2) This point has been emphasized by Raup (80).

Table 4-6	The rate of growth of agricultural and industrial wages, 13 countries, 1958-1967	
Country	Growth rate of agricultural wages, % per year	Growth rate of industrial wages, % per year
	w_a	w_i
Japan	11.96	9.88
Israel	10.34	9.48
Germany	9.44	8.86
Sweden	8.68	8.10
Netherlands	8.13	9.32
France	7.70	6.83
Norway	7.55	6.79
Ireland	6.95	7.22
Belgium	6.53	6.36
Canada	5.31	4.14
New Zealand	5.09	4.32
United Kingdom	4.91	6.11
United States	4.34	3.18

Summary regression:

$$w_a = \underset{(0.94)}{0.73} + \underset{(0.129)}{0.965}\, w_i \qquad r^2 = 0.836 \qquad n = 13.$$

Sources: Earnings data for all countries except New Zealand taken from I.L.O. Yearbook (36) various years.

New Zealand data from employment and wages data in Gillion and Frankel (23). Wherever possible, agricultural data was for the category of male permanent employees.

of only 1% per year - the trend was still strongly upward. In real terms, industrial wages rise faster than output price by approximately the amount of the growth in industrial productivity(1). There is therefore a systematic tendency for agricultural labour to become progressively more expensive relative to industrial inputs, which invariably are substituted for labour in Agriculture.

In addition to this incentive to economise on the use of labour, the price of output determines the extent to which farmers' incomes tend to be squeezed by rising input and wage costs. In most European countries and in North America the terms of exchange of the agricultural sector are determined by Government through farm support systems, and in nearly all cases output price has been increased somewhat less rapidly than the rate of growth of input prices.

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(1) Except to the extent that the share of profit alters, and to the extent that non-industrial input prices grow at a differential rate.

Comparative international data on agricultural prices is not particularly good, and for some countries is available only for a comparatively short recent period, but this general tendency can be seen from the data in Table 4-7 below. Only in Japan did output price grow faster than input prices - in all the other countries the reverse was the case, and in Belgium, Canada, and the United States the excess of the growth of input price over output price was more than 2 percentage points per year. When the international data becomes better, and has been available for a number of years for some of the more important countries, it may well be found that productivity growth in Europe has been the most rapid in those countries where the squeeze on farmers' incomes has been the most rapid. In such an event, it would be arguable that the causation runs primarily from cost squeeze to productivity growth.

The substitution of industrial imputs for labour, together with the economies resulting from larger scale operation, release labour which can be quantitatively important in countries such as New Zealand, Japan, Denmark, Italy, Austria and France where the agricultural sector is large, a point that has been emphasized by Kindleberger (44) and Kaldor (42). But this process necessarily involves considerable social dislocation. It has been shown by Cripps (10) that in France, Germany, Italy and Belgium natural wastage in Agriculture over the post-war period has been insufficient to explain the number of people leaving Agriculture. The absolute number of people born in rural areas and finding initial employment in Agriculture is at least as large as the number lost through natural wastage, so that the decline in agricultural employment is due to people leaving the land during the course of their working life.

This social migration is a phenomenon which, for political reasons, Governments do not permit to happen unduly rapidly, and in the countries of the European Economic Community the conflict between the desire for rapid

Table 4-7 The rate at which the growth of input prices exceeded the growth of output price, Agriculture, 11 countries.

Country	Period	Rate % per year
Netherlands	1958-66	1.9
Canada	1958-69	1.5
Australia	1958-69	1.4
United States	1958-69	1.3
Austria	1958-69	0.8
Italy	1958-69	0.7
Belgium	1959-69	0.7
West Germany	1958-69	0.6
Denmark	1960-68	-0.1
Norway	1958-69	-0.1
Japan	1958-69	-2.8
New Zealand)		
France)	data not available from international sources, but	
United Kingdom)	New Zealand is examined in detail in Table 4-9 below	

Source: F.A.O., "Production Yearbook," (19) various years

productivity growth and minimising the effects of transferring a large proportion of the working population from the country to the cities is a central problem.

In countries where the number of agricultural employees per hectare is low, however, such as New Zealand, the United States, Canada and Australia, the opportunity for increasing labour productivity by increasing farm size is smaller, at least within existing technology. In these four countries, as can be seen from column 3 of Table 4-8, the area of land per employee is over five times that of the next country, the United Kingdom, and in all the four countries, as can be seen from column 4 of the same table, labour productivity is extremely high. Labour productivity is difficult to measure, because of the different products produced in various countries, and because of variations in relative prices. The procedure used by Hayami & Rutton (30), from whom this table was taken, was to combine different outputs using the geometric mean of the relative prices of Japan, the U.S., and India. While no such procedure can be completely accurate, it is clear that the dispersion of labour productivity levels is so great (the largest is nearly 15 times the smallest) that errors in measurement are likely to be of only secondary importance. In the United Kingdom, where output per man is considerably below the level in New Zealand, the United States, Canada, and Australia, the increased use of industrial inputs, rather than organisational change, is customarily regarded as being the more important determinant of labour productivity growth. In the discussion of agricultural productivity growth in the 1970 U.K. White Paper on Britain and the European Communities (27) a supply elasticity of between 0.32 and 0.71 is assumed, and any effects of increasing output per man through organisational change are neglected as of secondary importance only. In the 1971 White Paper(28), the potential contribution of industrial inputs is again emphasized with

Table 4-8 Agricultural land area, male agricultural employment, and employment density, 14 countries, 1965.

Country	Land area Hectares x 10^3	Male employment x 10^3	Employment density Male employees / 10^3 hectares	Labour Productivity Wheat units
Japan	7,683	4,405	573.34	7.7
Italy	20,440	3,364	164.58	10.8
Netherlands	2,255	351	155.65	31.6
Belgium	1,791	174	97.15	38.6
Norway	1,008	95	94.25	26.4
Germany	14,059	1,273	90.55	28.5
Denmark	3,033	273	90.11	36.9
Austria	3,984	267	67.02	21.2
France	34,001	2,205	64.85	25.1
United Kingdom	19,623	799	40.72	34.2
New Zealand	13,634	109	7.99	113.4
United States	439,800	3,088	7.02	71.2
Canada	64,170	420	6.55	58.7
Australia	485,837	392	0.81	80.6

Source: Hayami and Rutton (30) Table A-5 and Table 4-2

the supply estimated at 0.91[1].

The argument as it has been advanced so far has not specified whether the industrial inputs that are substituted for labour are capital inputs, such as tractors, or current inputs, such as fertiliser and fuel. In practice both forms of substitution are likely, although for reasons which are examined below it is frequently difficult to establish as a question of fact which of the two types is quantitatively the more important.

This argument, that continued increase in the level of industrial inputs rather than organisational change is the dominant influence on varying labour productivity, almost certainly applies with even greater force to New Zealand, where, as can be seen from Table 4-8, labour productivity is higher than in any other country in the world[2].

Increasing productivity in New Zealand is not particularly much a matter of working within accepted techniques, increasing farm size accompanied by a steady movement of labour off the land into the towns. Rather, new techniques have to be devised to enable more output per man to be produced than has ever been achieved elsewhere[3].

The form which induced innovation would take in such circumstances has been discussed at length in the literature.

Hicks[4] (31) in 1932 posited that changes in the relative prices of the factors of production would influence the direction of technical change. Salter (85) argued against this, however, on the grounds that in equilibrium, where factors are equally expensive to the capitalist who therefore has no incentive to save on the use of any factor in particular:

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(1) See Miller M.H. in "The Economics of Europe" (78), ed. Pinder J. at page 136.

(2) Not all countries are shown in Table 3-8, but Hayami and Ruttan's table (op. cit.) shows all countries, none of which has higher labour productivity than New Zealand.

(3) See Danks, A.J. (11).

(4) At pp. 124-125.

> "When labour costs rise any advance that reduces total cost is welcome, and whether this is achieved by saving capital or labour is irrelevent. There is no reason to assume that attention should be concentrated on labour-saving techniques unless, because of some interest characteristic of technology, labour-saving knowledge is easier to acquire than capital-saving knowledge." (1)

More recent work by Hayami and Ruttan (30) has indicated that the nature of technical progress in various countries, and in particular the extreme opposites, Japan and the U.S., has in fact been to economise on the factor that was relatively more scarce. In Japan, where land is scarce relative to labour, and the absolute level of land productivity is high, private and public sector research has produced a stream of biological and chemical inventions that have led to a continuous increase in output per hectare. In the United States, great advances were made, particularly 20 years and more ago, in inventing and developing machinery that increased the quantity of land that a man could cultivate.

Hayami and Ruttan argue that this is evidence that public and private sector research has been responsive to the problem of eliminating "the most serious constraints on (the) growth of agricultural output,"(2) although they also observe some convergence in the patterns of technical change in the two countries in the last two decades. Furthermore, what appears as 'responsiveness' may in fact simply be a case, recognized by Salter, of labour-saving (or capital-saving, as the case may be) technology being easier to acquire.

Technical progress of both labour-augmenting and capital-augmenting forms has taken place in New Zealand. An example of land-augmenting

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(1) At pp. 43-44

(2) See also Ruttan (84) at page 711.

technical progress is the discovery of trace-element deficiencies in high-country soils. Correction of these deficiencies greatly increased the amount of grass that could be grown per hectare and so livestock numbers per hectare were able to be increased considerably. Aerial topdressing, which was first tried, as an experiment, in New Zealand after World War II, was substantially developed, and not only increased labour productivity in the spreading of fertiliser, but also enabled hilly and mountainous areas which hitherto had been unimproved to be spread with fertiliser and seed.

In the dairy industry continued improvements have been made. The development of the herringbone milking shed is important: in such a shed, fully equipped with electricity, high-pressure water and stainless steel equipment, one stockman can milk one hundred cows in an hour, the entry and exit of cows before and after milking not disturbing the remaining cows still being milked. Economies of scale in distribution have been exploited by the establishment of co-operative milk departments and the adoption of tanker transport of milk from the farm. Important developments have also taken place in plant-breeding, resulting in the use of new strains of rust-resisting grain and higher-yielding grasses; large reductions have taken place in the incidence of facial eczema and foot-rot in sheep[(1)].

The incentive to adopt new techniques has been reinforced in New Zealand, as in the O.E.C.D. countries examined above, by input prices, particularly labour, that have risen faster than output price. Whereas in most countries output prices are determined in large part by Government, in New Zealand they are the result of demand and supply conditions in foreign markets. The most important meat and dairy products market is the United Kingdom which takes approximately 70% of New Zealand's total exports of these commodities, and the wool market too is international, foreign buyers bidding

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(1) Most of these improved techniques are the result of Government-sponsored research in the Plant Research Station at Palmeston North, at the Dept. of Scientific and Industrial Research, at the Lincoln Agricultural College, and at a number of smaller research stations and experimental

at auctions held throughout the country. The overall price index of total exports is shown below in column 1 of Table 4-9.

Input prices have been rising steadily throughout the period, with the wage rate of labour (column 3) rising faster than the price of industrial inputs (column 2). The resulting terms of exchange faced by New Zealand farmers are shown in columns 4 and 5. The important industrial inputs purchased by Agriculture are, in decreasing order of expenditure, General farm requisites, fertiliser, Buildings and fences, Plant and machinery, Fuel and oil, Freight services, Electricity and power, Lime and seeds.

The continuous substitution of industrial inputs for labour, together with the progressive adoption of new techniques, has enabled New Zealand farmers to maintain their real incomes, despite terms of exchange that deteriorated by 11% for industrial inputs and 35% for labour between 1954 and 1964. This can be seen from column 6 of Table 4-9 below, in which farmers' net current money incomes have been converted into constant prices by deflating by the consumer price index.

This process of substituting industrial inputs for labour is examined further in the next section, where the nature of agricultural inputs in New Zealand, and the pattern of their growth, is examined in detail.

Table 4-9 Price indexes of New Zealand exports and farm inputs, terms of exchange, and farmers' real net incomes 1954/55 to 1965/66

Year	Price indexes		Terms of exchange			Real net incomes, $x10^6, 1954 prices
	Exports	Non-labour farm inputs	Wages	Non-labour farm inputs	labour	
1954	100.0	100.0	100.0	100.0	100.0	121.3
1955	102.6	102.6	104.3	100.0	98.4	113.8
1956	100.2	105.9	110.6	94.6	90.6	126.5
1957	99.0	109.6	118.9	90.3	83.3	126.6
1958	83.8	111.4	121.9	75.2	68.7	104.0
1959	96.2	113.1	129.3	85.1	74.4	113.3
1960	93.0	114.7	138.1	81.1	67.3	116.7
1961	87.6	116.3	147.2	75.3	59.5	98.1
1962	89.4	118.5	148.9	75.4	60.0	104.8
1963	98.8	119.2	156.6	82.9	63.1	121.5
1964	107.9	121.2	166.6	89.0	64.8	118.5
1965	103.8	-	175.1	-	-	-
	(1)	(2)	(3)	(4)	(5)	(6)

Sources:

Column: 1 Prices Wages and Labour Statistics, 1968 (68).

2 Compiled from data given in Philpott and others (77) page 53.

3. Wage and Salary bill in Agriculture, taken from Gillion and Frankel (23) page 30, Table 5, divided by employment taken from page 56, Table 71.

4. Column 1 ÷ column 2

5. Column 1 ÷ column 3

6. Net farm income in current prices taken from Philpott and others (77), Table 1 page 21, deflated by consumer price index, taken from Prices Wages and Labour Statistics, 1968 (68)

The problem of measuring investment

The varying rates at which economies of scale have increased productivity in Agriculture in the various countries examined in Table 4-5 is very likely to be one reason why investment was not found to be of statistical significance in explaining the behaviour of output and employment growth in Agriculture.

The second probable reason is the severe problem of allocating expenditure between the categories 'capital formation' and 'current inputs'. In industry the distinction is not hard to draw for the majority of inputs, because the production period is characteristically short, generally less than one year(1). But in Agriculture the case is not so clear, with many inputs, constituting up to perhaps 50% of all purchased inputs, contributing to the production of output for two or three years and being allocated sometimes to capital formation and sometimes to the category 'current inputs'.

In most countries information on purchased inputs is available only from input-output tables compiled from data collected in periodic censuses of production. But in New Zealand detailed estimates of farm inputs broken down into many categories have been made for the period up to 1964/65 by Philpott and others (77), and this data can be used to examine the way in which inputs into Agriculture behave over time.

In addition to demonstrating the arbitrary nature of the division of many purchased inputs between current and capital categories, it will be shown in this section that much investment expenditure in New Zealand has occurred in short bursts in times of high farm incomes, and it is argued that the capital so formed produces a flow of services for an indeterminate number of subsequent years. This would explain why, in New Zealand at least and perhaps in many other countries, production function investigation of time-series agricultural data yields odd results(2).

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(1) Estimates of the lag between the entry of an input into the manufacturing sector and its exit from the sector as a constituent of finished output have been made for U.K. manufacturing by Godley and Nordhaus (24).

(2) Such as, for example, the index of total factor productivity computed by Philpott (op. cit.) at page 15, and discussed later in this chapter, and also some of the functions estimated by Johnson (39), especially at page 81, where the coefficient on the capital term in an agricultural production function received a negative, and insignificant, coefficient.

The breakdown of inputs purchased by Agriculture provided by Philpott (77) reconciles in total with official estimates of total purchased inputs published in the "Report on National Income Statistics and Sector Accounts" (69). Consider the items shown in Table 4-10. While some of these items are clearly current inputs (for example electricity, fuel, oil, and grease) some part at least of each of the other expenditures, such as fertiliser, lime and seeds properly constitute capital expenditure. Included in the 'Farm requisites' heading are sacks and woolpacks, insecticides, dips, licks, weedkillers, saddlery, and netting and strainers for fencing - these last two items in particular contribute to the production of output for a number of years after they are purchased.

Over the period 1949 to 1964 these inputs constituted almost half by value of the total purchases of inputs by Agriculture. Philpott was not able to disaggregate the remaining half, which appear as item 8 in Table 4-10. The two groups of inputs show markedly different behaviour over the period: the annual values (in constant prices) of both groups of inputs are shown in Chart 4-1. It can be seen that the volume of inputs in Group I[1] move steadily throughout the period, and at about the same rate as the volume of gross output. The behaviour of the large "Other expenses" group of inputs[2] was quite different, however, showing a pronounced downward trend until 1960, followed by a strong upward trend. These Group II inputs did not therefore show any systematic association with the growth of gross output.

The movement of this large group of inputs did, however, in addition to the downward trend for much of the period, show a marked correlation with the value of gross output. This can be seen from an examination of columns 2 and 6 of Table 4-11 and from the regression equation

$$I_{II} = \underset{(19.1)}{-69.7} - \underset{(0.478)}{4.758t} + \underset{(0.047)}{0.3960_{val}} \qquad r^2 = 0.921, \; n = 16$$

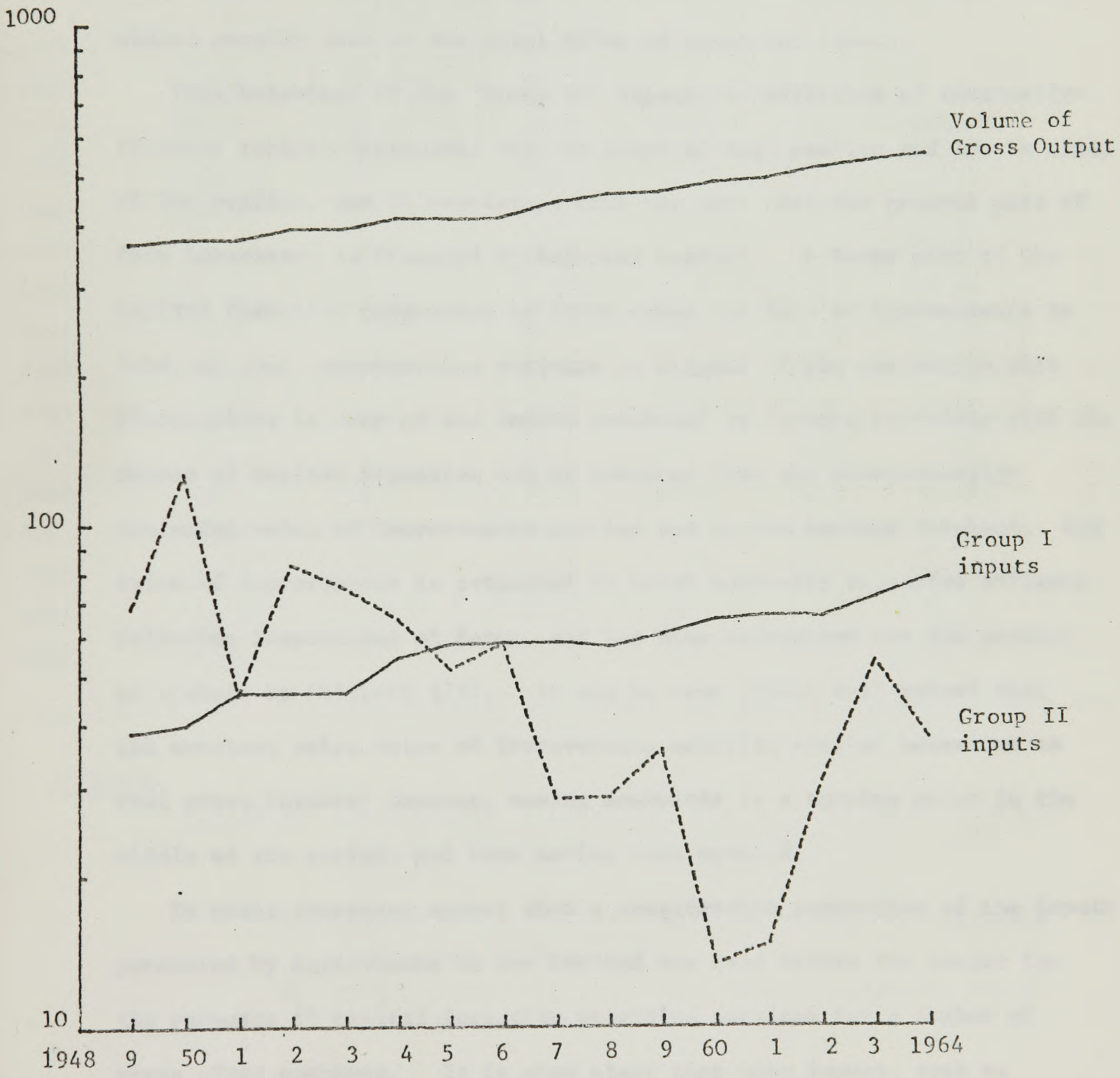
in which I_{II} is the value of group II inputs in 1949 prices, Q_{val} is the

(1) Items 1 to 7 inclusive
(2) Item 8.

Table 4-10	The value of recorded inputs purchased by New Zealand Agriculture, 1949
	£ m.
1. Fertiliser	11.8
2. Fuel, oil and grease	9.3
3. Farm requisites	7.0
4. Rail and cartage	5.6
5. Electricity	2.5
6. Lime	1.9
7. Seeds	0.4
8. Other expenses	71.8

Source: Philpott and Others (77)

Chart 4-1 The Growth of real Gross output, Group I inputs, and Group II inputs, New Zealand Agriculture, 1948 to 1964



Sources: Group I and Group II inputs: Table 4-11
Volume of Gross Output: Philpott and Others (77)

value of gross output in constant prices, and t is a time trend. This relationship is very close, as can be seen from Chart 4-2 below, in which the actual and expected values of group II inputs are plotted. It is therefore apparent that, in addition to being able to economise on the use of labour, farmers have also been able to economise continuously on the use of 'Group II' inputs, which have accounted, on average, for almost exactly half of the total value of purchased inputs.

This behaviour of the 'Group II' inputs is indicative of internally-financed capital formation, high in times of high profits and low in times of low profits, and is consistent with the fact that the greater part of farm investment is financed by internal capital. A large part of the capital formation undertaken by farms takes the form of improvements to land, so that corroborative evidence in support of the contention that fluctuations in many of the inputs purchased by farmers correlate with the degree of capital formation can be obtained from the independently-estimated value of improvements carried out on New Zealand farmland. The value of improvements is estimated by Local Authority valuation officers following inspections of farms, and has been aggregated for the country as a whole by Philpott (77). It can be seen (Table 4-12 below) that the constant price value of improvements exhibits similar behaviour to real gross farmers' incomes, moving downwards to a turning point in the middle of the period, and then moving back upwards.

It would therefore appear that a considerable proportion of the inputs purchased by Agriculture in New Zealand are used within the sector for the purposes of capital formation providing services for a number of years after purchase. It is also clear that many inputs, such as fertiliser and seeds, and various activities such as scrub-clearing, contribute to the production of output for several years, although their life may be considerably shorter than the customary life of capital goods in industry. To the extent that

Table 4-11 Annual percentage changes in real gross farm income and real agricultural inputs

Production Year	Gross farm income, constant 1949 prices		Group I inputs constant prices		Group II inputs, constant prices	
	$ x 10^6	Change %	$ x 10^6	Change %	$ x 10^6	Change %
	(1)	(2)	(3)	(4)	(5)	(6)
1949	366.2	-	38.6	-	68.4	-
1950	537.5	46.8	40.0	3.6	126.8	85.4
1951	343.7	-36.1	46.4	16.0	45.8	-63.9
1952	394.4	14.8	46.5	0.2	83.5	82.3
1953	406.7	3.1	46.2	-0.6	75.0	-10.2
1954	398.9	-1.9	54.4	17.7	65.0	-13.3
1955	385.8	-3.3	58.2	7.0	51.6	-20.6
1956	423.2	9.7	58.5	0.5	58.3	13.0
1957	390.0	-7.8	58.6	0.2	28.4	-48.7
1958	369.0	-5.4	57.3	-2.2	28.6	0.7
1959	402.8	9.2	60.8	6.1	35.6	24.5
1960	386.1	-4.1	65.2	7.2	13.3	-62.6
1961	368.4	-4.6	66.4	1.8	14.6	9.8
1962	401.5	9.0	65.8	-0.9	30.7	110.3
1963	465.0	15.8	72.2	9.7	53.7	74.9
1964	476.6	2.5	78.9	9.3	37.6	-30.0

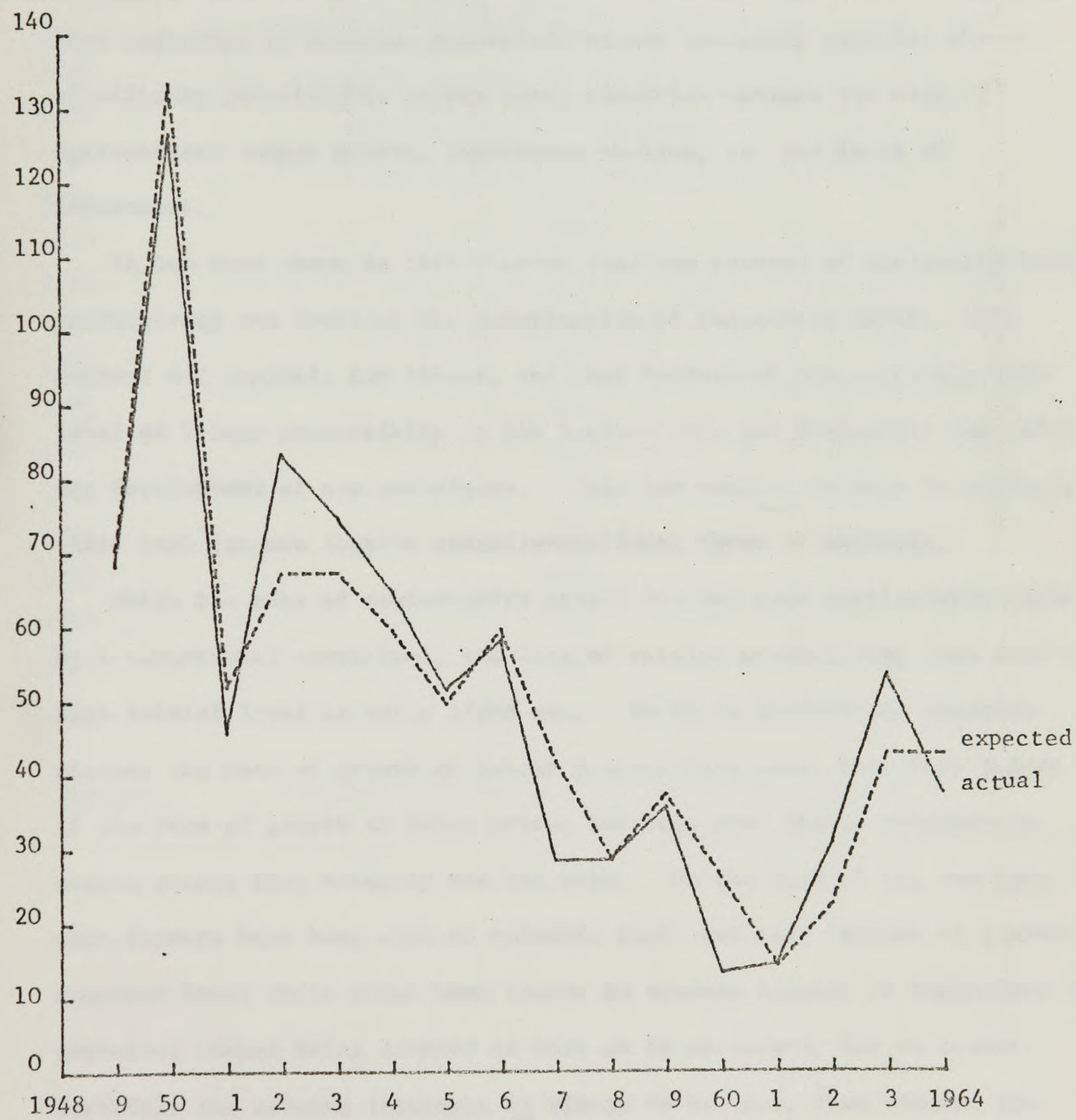
Sources:

Column 1: Current gross farm income from N.Z. Year Book, various years, deflated by an index of input prices from Philpott and Others (77) Table XIV, p.55.

3: Sum of Rows 2,3,4,5,6,7,9, Table II page 24, Philpott and others (77) page 24

5: Philpott and Other, op. cit, Table II page 24, row 11.

Chart 4-2 Actual and Expected Group II inputs, New Zealand Agriculture, 1949-1964



Source: Data in Table 4-5, and regression equation underneath

this phenomenon occurs in other countries, the problem of allocating purchased inputs between the 'current' and 'capital' categories is therefore likely to be sufficiently severe as to lead to considerable differences in what is included under the heading 'investment'. This, together with the differential rates at which economies of scale have been exploited in different countries, almost certainly explains why no significant relationship exists among countries between the rate of agricultural output growth, employment decline, and the level of investment.

It has been shown in this Chapter that the process of increasing labour productivity has involved the substitution of industrial inputs, both current and capital, for labour, and that because of the extremely high level of labour productivity in New Zealand this has frequently necessitated the development of new techniques. This has enabled farmers to maintain their real incomes despite steadily-declining terms of exchange.

While the rate of productivity growth has not been particularly rapid by international comparison, the task of raising productivity from such a high initial level is not a light one. It is an interesting question whether the rate of growth of labour productivity would have been higher if the rate of growth of input prices had been even higher relative to output prices than actually was the case. On the face of it, the fact that farmers have been able to maintain their net real incomes at a near-constant level while costs have tended to squeeze incomes is suggestive of technical change being adopted as fast as is necessary, but no faster. Certainly the reverse statement is likely to be true, that without the steady pressure on wage costs and input costs, caused in large part by the growth of industry, behind quota protection, described in Chapter 2, the adoption of new techniques would have been less rapid and productivity growth would have been less rapid. Further, the pressure for the development of new techniques would have been less, and some of the discoveries

Table 4-12 The value of improvements carried out to New Zealand Agricultural land, 1949 to 1964, constant 1949/50 prices.

Year	$ m
1949	30.2
1950	42.6
1951	55.4
1952	47.7
1953	66.5
1954	56.6
1955	50.6
1956	40.6
1957	40.2
1958	26.6
1959	46.0
1960	46.9
1961	50.6
1962	50.4
1963	50.4
1964	48.4

Source: Philpott and others (77) Table XVII, page 61

that today are widely accepted and used might never have been made.

In the next chapter, the growth of output and productivity in the non-goods-producing (service) sector of the economy is examined.

Chapter 5

The Growth of Output in the Service Sector

In this chapter the growth of output in the remaining part of the economy, designated as 'All Services' in the Official New Zealand Statistics, is examined. Included under this heading is a large number of diverse activities, designated as new I.S.I.C. divisions 7 to O, which account altogether for very nearly half of total G.D.P.(1). A large activity in this sector is Wholesale and Retail Trade, which produces 20.2%(2) of total G.D.P. (and nearly half of the G.D.P. originating within the Service Sector). It can be seen from Table 5-1 that the relative size of this sector in New Zealand is about average for high-per-capita income countries, New Zealand lying exactly in the middle, and the New Zealand value being as much below the top value as it is above the lowest.

The next largest of the industry groups which is customarily distinguished in O.E.C.D. publications(3) is the group designated in this thesis as "Other Services, both Public and Private". Included under this heading are such diverse activities as banking, insurance, finance, sanitary services, education, other community services, recreation services, personal and household services, the activities of the armed forces, and various other Government and Local Authority services which have not been separately specified. Altogether these activities produce 15.3%(2) of total G.D.P. It will be shown below that it is extremely difficult to

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(1) It can be seen from Table 5-2 that, in 1954/55 (the base-year of the official index of production) 45.8% of total G.D.P. originated within the services sector of the economy. The value of this ratio in later years depends upon the rate at which service output is deemed to grow in relation to the rest of the economy. Because it is argued in Chapter 6 that the official statistics under-estimate the rate of growth of Service output, at least in relation to the performance of other countries, the question of the relative size of the Service sector in the years after 1954/55 is examined in Chapter 7.

(2) In 1954/55 - see Appendix Table 3 to Chapter 7.

(3) Such as, for example, the O.E.C.D. Labour Force Statistics (72).

estimate the rate of gorwth of the provision of these services, so that necessarily the rate of growth of labour productivity associated with the provision of these services is also in doubt. A wide variety of procedures has been adopted by economists and statisticians in different countries, and this industry-group is so large that the particular conventions adopted in measuring the rate of output growth can have a marked effect on the measured rate of growth of the G.D.P.

Table 5-1 The proportion of total G.D.P. originating within "All Services", various countries, 1954

Country	Proportion, %
United States	56.2
Belgium	51.0
Canada	50.1
United Kingdom	47.6
Norway	46.5
Netherlands	46.1
New Zealand	45.8
Italy	43.2
France	41.5
West Germany	39.1
Japan	38.6
Denmark	38.5
Austria	33.4

Source: New Zealand: Table 5.1

All other countries: Calculated from sectoral data on Gross Domestic Product at factor cost in "National Accounts of O.E.C.D. Countries 1950-1968 (75)

The other industry-group customarily distinguished is Transport and Communication, which, in the provision of rail, road, water and air transport services, together with radio, television, newspaper, and post office services, provides 10.3% of total G.D.P.(1)

Table 5-2 The proportion of total G.D.P. originating in each of the major industry-groups of the New Zealand economy, 1954-55 *

New ISIC Major Division	Industry Group		Proportion of G.D.P. originating %
1	Agriculture		21.8
	Farming	20.7	
	Forestry	0.8	
	Fishing	0.3	
2	Mining and quarrying		1.0
3	Manufacturing		21.6
4	Electricity, Gas, and Water		1.6
5	Construction		8.2
6	Wholesale and Retail Trade		20.2
7	Transport and Communication		10.3
	Transport	8.6	
	Communication	1.7	
8	Banking, Insurance and Finance		2.9
9	Community, social and personal services		12.4
0	Activities not adequately defined		
			100.0

* The weights shown above for each of the Divisions 1 to 5, and for divisions 7 to 0 as a whole, are those used in the compilation of the official index of Gross Domestic Product in constant prices published in the Official New Zealand Year Book (67), and, being the share of total G.D.P. originating within each Division, are obtained from the Inter-Industry study of the New Zealand Economy 1954-55 (69). The individual weights for each of the Divisions 7 to 0 have been derived on the same basis from the input-output Table 9 of Gillion and Frankel (23).

(1) in 1954-55, See Appendix Table 3 to Chapter 7.

The importance of the growing size of the service sector for modern industrial countries is that this sector may impose a check, and perhaps a severe one, on the rate of growth of output per head in the economy as a whole. Productivity in the Service sector of an economy is characteristically thought to grow less rapidly than productivity in the industrial sectors[1], so that if the income elasticity of demand for services is sufficiently high that service sector output grows at a rate similar to that of industrial output, an increasing proportion of the total labour force will become engaged in the provision of services, and productivity growth in the economy will tend towards the low rate of productivity growth in the service sector. In the limiting case, where the output of the service sector grows at the same rate as the industrial sector and with zero productivity growth, the proportion of the labour force engaged in the service sector tends asymptotically to 100% and and productivity growth in the economy as a whole tends asymptotically towards zero[2].

In view of such possibilities, it is important to establish the nature of the demand for service sector output, and to examine the factors which determine the rate at which productivity growth is possible in the many branches of service sector activity. It is therefore unfortunate that the basic task, that of calculating the rate of growth of Service output and productivity growth, has presented very great difficulties to economists and statisticians. The difficulties have been so great that whereas in estimating the rate of output and hence labour productivity growth in the Industrial sectors a high degree of concensus has been

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(1) Although to a certain extent this is an article of faith rather than a demonstrated fact: it will be shown in Chapter 7 that the procedures for measuring the rate of Service output growth are quite arbitrary, so that statements about the rate of growth can be made only with the very greatest caution.

(2) This process has been described by Baumol (3).

reached on the appropriate methods of measurement, in the case of Services a great diversity of procedures has been adopted. The significance of this for New Zealand lies in the fact that, as will be shown below a very low rate of growth has been assumed in the compilation of the Official series of real output. This phenomenon, together with the rapid growth in the importance of the service sector not only causes measured G.D.P. per person employed to grow more slowly than would be the case if a different measurement procedure were adopted, but also could lead to the suggestion that G.D.P. per head will in the future grow progressively more slowly.

In the next section, therefore, the growth of output in the Service sector is examined in detail.

The growth of output in the Services sector in New Zealand: the state of knowledge

Member countries of the O.E.C.D. customarily provide separate output indexes for Transport and Communication, Wholesale and Retail trade, Banking Insurance and Real Estate, Ownership of Dwellings, Public Administration and Defense, Health and Education services, and miscellaneous services, thereby subdividing the Service sector into seven components. The availability of disaggregated labour data is, however, more limited; in the O.E.C.D. publication "Labour Force Statistics" (72) the Services sector is divided into only five parts, Transport and Communication, Retail and Wholesale trade, Banking, Insurance and Finance, Community Social and Personal Services, and Other Activities not adequately defined. This necessarily means that when productivity growth in the Service sector is being examined, disaggregation can be carried out only as far as these five sub-sectors for most O.E.C.D. countries.

New Zealand, however, which is not a member of O.E.C.D., does not publish official disaggregated indexes of output for the Services sector, although extremely comprehensive labour data is readily available[1]. The only

(1) In the annual publication of the New Zealand Department of Statistics "Prices, Wages and Labour" (68), biannual data on employment in more than 70 different activities is presented.

official Services sector output index, which is published as a supplement to the Monthly Abstract of Statistics (64) and republished in the New Zealand Official Yearbook (67), is an aggregate index for the Services sector as a whole. This represents a very severe limitation of the usefulness of the official New Zealand output data, for the Services sector, as has already been seen produces nearly 50% of total G.D.P.(1) Despite the usefulness that disaggregated indices would have, however, the New Zealand Department of Statistics does not intend, at least at present, to make such information available. In a letter to the author the Government Statistician states that

> "The component indexes used in the compilation of the All Services index of production are not published".

The letter goes on to state that

> "In any event, although the All Services index includes coverage of the services you mentioned, it is not possible to provide individual group indexes which would be comparable with the groups as published by O.E.C.D. countries". (2)

Nevertheless, despite the fact that only the one index of output for the entire Services sector is published in the Official Index of Production, additional information on the behaviour of the various components of the Services sector can be derived from the miscellany of other official data published for purposes other than the compilation of an index of production. In a number of instances, this data is similar, although not necessarily identical in coverage, to that used by O.E.C.D. countries in the compilation of their indexes of output for the five service sector components, so that it is possible, by using this data, to compile indexes of output for Commerce, Transport and Communication, and to a lesser extent, Banking and Finance, and the two other classes of activity included in Other Services both Public and Private.

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(1) See Appendix Table 3 to Chapter 7.

(2) For the full text of the letter, see Appendix 1 to this Chapter.

Much of this evidence has been collected by Gillion and Frankel (23) of the New Zealand Institute of Economic Research, in an important book which, published in 1967, provides input-output data for the New Zealand economy for the period 1954/55 to 1965/66. The particular aim of the research was "to provide basic historical information on which an input-output model of the economy can be constructed", and was carried out with the assistance of various members of the Department of Statistics. The purpose of Gillion and Frankel's work was, as the title indicates, to provide more disaggregated information on the New Zealand economy than had previously been available. But because, as will be shown in this chapter, the procedures adopted by them in compiling indexes of the real output of Wholesale and Retail trade and Transport and Communication accord quite closely with those followed by most O.E.C.D. countries, one of the uses to which their data can be put is to provide an independent check on the official index of Service sector output. This exercise is performed at the end of this chapter.

The procedure followed by O.E.C.D. countries in determining the value of distribution output in constant prices is to obtain value-added in a base year from census information, and then to change this value over time by the proportionate changes in the index of the volume of retail sales [2]. Thus if value added in 1954/55 is found from census information to be £100, and if between 1954/55 and 1955/56 the volume of retail sales grows by 20%, then the value of Distribution output in 1955/56 is deemed to be £120 in 1954/55 prices. Information on the volume of retail sales is characteristically obtained by deflating current prices expenditures[3].

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(1) Gillion and Frankel (23), page 1.

(2) See for example the United Kingdom Central Statistical Office publication "National Accounts Statistics - Sources and Methods" (95), especially at pages 79 and 86, for a description of the use of this procedure in the U.K.

(3) The method of expenditure deflation is used by Belgium, Denmark, Germany, the Netherlands, Norway, Sweden, the U.K., Canada and the U.S. Italy and France use an index based directly on the movement of physical quantities - see T.P. Hill (31), page 50.

In New Zealand only one series of distribution output in constant prices is published, this series having been calculated by Gillion and Frankel[1] for the period 1954/55 to 1965/66 using the volume of retail sales as the principal indicator in the same manner as in O.E.C.D. countries. The basic information is provided by five-yearly censuses, which are supplemented by quarterly surveys. The basic data, presented in a form that is compatible with the overall sector accounts compiled as Appendix 1 to Chapter 7, is given in Table 5-3.

Table 5-3 Index and Value in constant 1954/55 prices of G.D.P. originating within Wholesale and Retail Trade in New Zealand

Production Year	G.D.P. originating in Wholesale and Retail Trade (1) Index 1954/55 = 100	(2) Value, $m 1954/55 prices
1954	100.0	380
1955	102.3	389
1956	102.7	390
1957	107.2	407
1958	104.5	397
1959	106.2	404
1960	114.8	436
1961	120.8	459
1962	125.4	477
1963	137.1	521
1964	147.7	561
1965	152.9	581

(1) The index of the volume of Wholesale and Retail output is obtained from Gillion and Frankel (23), Table 26, row 35, page 26.

(2) The value of G.D.P. originating within Wholesale and Retail Trade (column 2) is obtained as $m.380 x column 1/100. The base-year value of $m. 380 is obtained from Appendix Table 3 to Chapter 7.

(1) Op. cit., page 26. While information on the volume of retail sales is published by the Department of Statistics, the important feature of Gillion and Frankel's work has been that they have ensured the consistency of this expenditure data with the sum of all other classes of expenditure in the economy.

The determinants of the rate of wholesale and retail output growth

Over the period 1954/55 to 1965/66, Wholesale and Retail output (frequently designated hereafter as 'Commerce') grew at a mean exponential rate of 3.9% per year(1). The purpose of this section is to examine what factors determined that rate of growth of output, and to examine the extent to which this rate is consistent with what would be expected on the basis of international experience.

In industrial countries wholesale and retail trade is virtually an extension of industry, distributing the goods that industry produces. It is therefore to be expected that the measured rate of growth of Commerce output will be higher in those countries which have experienced the most rapid growth of absorption of finished industrial products. The relationship would not, of course, be expected to be perfect, even if there were no measurement errors(2), but a positive relationship is to be expected, and that there is such a relationship can be seen from the international data in Table 5-4 and the summary regression beneath. As in the case of all other comparative tables throughout this thesis, the summary regression equation was calculated without taking New Zealand data into account, so that the general behaviour with which New Zealand is being compared does not contain any New Zealand influences, which would be unwarranted.

The summary regression equation has a fairly small and statistically insignificant constant term, and a significant coefficient which indicates that across countries there is, as would be expected, a positive association between the measured rate of growth of commerce output and the

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(1) This value is derived from the data in Table 5-3.

(2) For example, investment goods may pass through the wholesale sector but will not pass in quantity through the retail sector, so that the more rapidly a country's investment expenditure is growing in relation to consumption expenditure, the more slowly will its commerce output tend to grow in relation to industrial output. Furthermore, trade can alter the relationship: to the extent that the volume of industrial exports is growing faster than the volume of industrial imports, the growth of the Commerce sector will tend to be lower in relation to the growth of industrial output.

rate of growth of manufacturing output. Characteristically the growth in commerce output is less than proportionate to the growth of manufacturing output, a growth of manufacturing output of, for example, 10% being associated on average with a rate of growth of commerce output of 7.2%. This relationship is not, however, wholly satisfactory for explaining the rate of growth of commerce output in New Zealand, for the following reason.

Table 5-4 Industrial and Commerce Output Growth, 11 O.E.C.D. countries(1)

Country	Period	Commerce Growth Rate % per year $q_{commerce}$	Manufacturing Growth Rate, % per year $q_{manufacturing}$
Japan	1953-64	10.7	13.5
Austria	1951-66	7.1	5.2
West Germany	1951-65	6.9	8.4
Italy	1951-63	6.6	7.9
Netherlands	1951-65	5.7	5.9
France	1951-64	4.8	5.8
Norway	1951-65	4.6	4.3
Belgium	1951-64	4.0	4.8
New Zealand	1954-65	3.9	6.3
United States	1951-66	3.8	3.8
United Kingdom	1951-65	3.1	3.3
Canada	1951-66	2.2	5.2

Summary Regression:

$$q_{commerce} = \underset{(0.82)}{0.96} + \underset{(0.122)}{0.718} q_{manufacturing} \qquad r^2 = 0.776, \; n = 11$$

Source: Output growth rates calculated from constant-price output data in National Accounts of O.E.C.D. countries (75).

In all of the industrial countries examined in Table 5-4, Agriculture is small in relation to industry; the products of the agricultural sector are not exchanged in international markets for industrial goods, and so Agriculture is not a particularly important determinant of the volume of industrial goods available for distribution. Accordingly the rate of growth of industrial production is indicative of the rate of growth of absorption of industrial products. In New Zealand, however, as has been seen in previous chapters, Agriculture is as important as industry in terms of the proportion of G.D.P. originating within the sector, so that the growth of both Agriculture and Industry is therefore important in determining the rate of growth of the quantity of goods to be distributed.

The rate of growth of output of Agriculture and Industry, taken as a whole, was 5.1%[1] per year over the period 1954/55 to 1965/66, somewhat lower than the Manufacturing rate of growth of 6.3% calculated in Chapter 2. On the basis of this statistic and the regression equation beneath Table 5-5 a 4.6% per annum rate of growth of Commerce output would be expected. This is a somewhat higher rate than the actual rate of 3.9% per year.

It is not possible to establish with certainty why it is that the rate of growth of Wholesale and Retail trade should be so much below what, on international evidence, would be expected, because information on the composition of G.D.P. by type of expenditure is not published. Whereas in the national accounts of most O.E.C.D. countries a breakdown of total expenditure into the categories Private Consumption, Government Consumption, Gross Capital Formation, Exports, and the change in stocks is performed, in New Zealand no such information is published by Official sources. One possible clue, however, may lie in the behaviour of Government Consumption, information on which is available in estimates prepared by Gillion and Frankel[2]. This data shows real Government

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(1) This value was derived from the constant-price G.D.P. data for Agriculture and Manufacturing given in Appendix Table 3 to Chapter 7.

(2) Op. Cit. page 39.

Consumption expenditure rising at a mean exponential rate of 5.6% per year(1). This is considerably faster than the rate of growth of G.D.P., which was 4.3% per year(2) - indeed the ratio of the growth rate of real Government expenditure to the growth rate of G.D.P. is 1.30, which is markedly higher than the ratio exhibited by other countries. In Canada over a similar period, for example, the ratio was 1.02, for the United States 1.01, for Japan 0.84, for France 0.99, for Germany 1.02, for Italy 0.99, and for the United Kingdom 0.92. For all the countries considered as a weighted whole, the ratio was 0.99(3).

With real Government consumption Expenditure rising so much faster in New Zealand in relation to G.D.P. than is the case in other countries, it is quite likely, although it cannot be definitely established, that this is at least part of the reason for the apparently relatively slow growth of private consumption. Evidence of the close dependence of Commerce on Manufacturing and Agriculture in New Zealand which was taken for granted in the procedure above can be obtained from the data in Table 5-5 and the summary regression beneath. The equation indicates that year-to-year changes in Distribution output in New Zealand correlate significantly with both the percentage change in manufacturing output and the percentage change in imports when considered together. Accordingly taking the rate of growth of Manufacturing and Agriculture together as the major determinant of the volume of retail and wholesale sales would appear to be justified.

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(1) From $m 253.33 in 1954/55 to $m 443.03 in 1965/66.

(2) See Appendix Table 3 to Chapter 7.

(3) See 'Expenditure Trends in O.E.C.D. countries', (71) page 24.

Table 5-5 Year to year changes in Distribution output, Manufacturing output, and imports, New Zealand

Year	Distribution output growth $\dot{q}_d$ %	Manufacturing output growth $\dot{q}_m$ %	Import growth $\dot{m}$ %
1954-55	2.3	5.6	0.2
1955-56	0.4	0.6	0
1956-57	4.4	7.0	7.5
1957-58	-2.5	5.6	-7.3
1958-59	1.6	3.5	3.9
1959-60	8.1	9.8	5.1
1960-61	5.2	5.1	5.3
1961-62	3.8	4.5	-2.1
1962-63	9.3	10.4	15.1
1963-64	7.7	13.0	0.6
1964-65	3.5	6.8	7.2

Summary Regression:

$$\dot{q}_d = -0.79 + 0.585\dot{q}_m + 0.302\dot{m} \qquad r^2 = 0.793$$
$$(1.21) \quad (0.104) \quad (0.177) \qquad n = 11$$

Source:

$\dot{q}_d$: Calculated from Table 5-4

$\dot{q}_m$: Calculated from N.Z. Industrial Production Statistics, 1969 N.Z. Year Book, (67).

$\dot{m}$: Calculated from N.Z. External Trade Statistics, (66).

Banking and Finance: the growth of output

The international conformity exhibited in the measurement of the growth of Distribution output does not extend to Finance and Banking. Many countries deflate wage payments by a price index, thereby generally ascribing some labour productivity growth: others rely largely on employment growth as the indicator, thereby attributing little productivity growth to the sector(1). The U.K. is notable for adopting a complicated mixture of physical and deflated expenditure indicators, such as insurance premiums less claims deflated by various price indexes, numbers of cheques cleared, bank deposits and advances deflated by the consumer price index and the number of stock exchange transactions(2). While estimates of the rate of growth of output in Banking and Finance in New Zealand have been prepared by Gillion and Frankel, these estimates rely in large part on employment growth as the indicator, so that productivity growth is estimated by Gillion and Frankel as being only slightly more rapid than employment growth in Banking and Finance. For the purpose of completing the Service sector's accounts, it is assumed in this chapter that the rate of growth of output in Banking and Finance is exactly the same as the rate of growth of

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(1) See Hill T.P. "The Measurement of Real Product" (31).

(2) The full list of indicators used in the U.K. shows the considerable ingenuity of the statisticians compiling this output index. Indicators of the volume of insurance output are consumers' expenditure on life assurance at constant prices; accident premiums paid less claims deflated by the consumer price index; fire insurance premiums paid less claims deflated by a price index for domestic capital formation; marine aviation and transit insurance premiums paid less claims deflated by average of unit value indices for imports and exports; motor vehicle insurance premiums paid less claims deflated by a price index of vehicles; and miscellaneous insurance premiums paid less claims deflated by the consumer price index. The movement of Banking and bill-discounting output is given by the number of cheques cleared; total bank deposits deflated by the consumer price index; the amount remaining invested in National Savings deflated by the consumer price index; and bank advances deflated by the consumer price index. The output growth of other financial institutions is also represented by a number of physical and expenditure indicators. See "The Index of Industrial Production and Other Measures", (96), page 30.

employment in that sector. This rate was 3.5% per year[1] over the period, and so for the purposes of this chapter that rate will be taken as representing the rate of growth of output. This assumption will however be modified in Chapter 6 to examine the effects that alternative assumptions would have on the estimated rate of growth of output in the sector, as well as on the estimated rate of growth of G.D.P. as a whole.

Table 5-6 Index of Employment, and value in constant 1954/55 prices of G.D.P. originating within Banking and Finance

Period	Index of Employment 1954/55 = 100	Value of G.D.P. originating, 1954/55 prices, $m.
1954/55	100.0	54
1955/56	101.3	55
1956/57	103.5	56
1957/58	107.5	58
1958/59	110.0	59
1959/60	112.6	61
1960/61	114.8	62
1961/62	118.3	64
1962/63	123.5	67
1963/64	128.6	69
1964/65	136.7	74
1965/66	146.6	79
	(1)	(2)

Source: Column 1: basic data source: New Zealand Department of Statistics publication "Prices, Wages and Labour". (68), converted to production-year basis by Gillion and Frankel (23), Table 31, page 56, from which this index was derived (row 36).

Column 2: Base-year G.D.P. originating of $m 54 taken from Appendix 3 to Chapter 7, x column 1/100. The mean exponential rate of growth of columns 1 and 2 is 3.5% per year.

(1) This figure is derived from data in Appendix Table 2 to Chapter 7, which gives the industrial distribution of the labour force in New Zealand for 1954/55 and 1965/66.

Transport and Communication - the growth output

As in the measurement of the rate of Commerce output growth, there is a considerable degree of international conformity in the way in which the growth rates of Transport and Communication are estimated. The physical measures of ton-miles and passenger miles are used almost exclusively in O.E.C.D. countries in estimating the growth of air, road, rail, and sea transport, and Gillion and Frankel have produced output series for New Zealand by a similar method(1).

The overall growth rate of Transport indicated by Gillion and Frankel for New Zealand is 4.4% per year - see Table 5-7 below. In the national accounts of O.E.C.D. countries volume indicators are usually used for measuring the rate of Communication output growth, although Belgium uses an index of employment. Gillion and Frankel's index uses data on the numbers of letters, parcels, telegrams and toll calls handled by the Post Office, transmission hours of radio and television stations, together with a certain amount of deflated revenue data. The rate of growth of output indicated by this series between 1954/55 and 1965/66 is 5.2% - see Table 5-7 below. In the O.E.C.D. employment data, Transport and Communication are combined, and so far international comparability the two New Zealand output series have to be aggregated. The combined rate of growth is 4.5% per year - see column 6 of Table 5-7.

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(1) Gillion and Frankel drew heavily on the gross output volume indicators published in Section 11 of the Official New Zealand Year Book (67). These indicators include: Railways - revenue, ton-miles and passenger miles; Shipping - total tonnage handled at ports and number of calls; Road transport - revenue and revenue per mile, vehicle miles, passengers carried; Air transport - freight-ton-miles, passenger miles, revenue, revenue per mile.

Table 5-7 Indexes and Value in constant 1954/55 prices of the G.D.P. originating within Transport and Communication in New Zealand

Production Year	Transport		Communication		Transport and Communication	
	Index	Value of GDP originating, 1954/55 prices $m	Index	Value of GDP originating, 1954/55 prices $m	Index	Value of GDP originating, 1954/55 prices $m
1954/55	100.0	162	100.0	32	100.0	194
1955/56	104.5	169	106.7	34	104.6	203
1956/57	106.5	173	111.3	36	107.7	209
1957/58	106.0	172	118.7	38	108.2	210
1958/59	109.3	177	123.0	39	111.3	216
1959/60	111.5	181	130.7	42	114.9	223
1960/61	116.9	189	141.1	45	120.6	234
1961/62	122.3	198	149.0	48	126.8	246
1962/63	121.0	196	156.1	50	126.8	246
1963/64	131.6	213	163.4	52	136.6	265
1964/65	149.4	242	171.2	55	153.1	297
1965/66	161.7	262	177.6	57	164.4	319
	(1)	(2)	(3)	(4)	(5)	(6)

Sources:

Column 1: Derived from Gillion and Frankel (23), Table 26, page 51, rows 37-40.

2: Base-year value added of $m 162 (obtained from Appendix Table 3 to Chapter 7) x column 1/100.

3: Derived from Gillion and Frankel op.cit. Table 26, page 51, row 41.

4: Base-year value added of $m 32 (obtained from Appendix Table 1 to Chapter 7) x column 3/100.

6: = column 2 + column 4.

5: Index of column 6, base 1954/55 = 100.0. Mean exponential rate of growth of column 6 is 4.5% per year.

It can be seen from Table 5-8 that the New Zealand rate of Transport and Communication output growth of 4.5% per year is an average rate of growth in international comparison, being exceeded by six of the major O.E.C.D. countries. The mean rate of growth of all countries other than New Zealand was 5.1% per year.

Table 5-8 The rate of growth of Transport and Communication, various countries.

Country	Period	Growth Rate, % per year
Japan	1953-1964	9.6
Italy	1951-1963	6.8
Norway	1951-1965	6.2
Netherlands	1951-1965	5.8
Austria	1951-1966	5.1
West Germany	1951-1965	4.8
Canada	1951-1966	4.5
(New Zealand)	1954-1965	(4.5)
France	1951-1964	3.6
United States	1951-1966	3.6
Belgium	1951-1964	3.5
United Kingdom	1951-1965	2.2
Mean (excluding New Zealand)		5.1

Source: National Accounts Statistics of O.E.C.D. countries (75) for all countries except New Zealand.
For New Zealand, see Table 5-7.

The determinants of the rate of growth of Transport and Communication

Just as the output of the goods-producing sectors determines in large part the throughput of Distribution, so too is the volume of goods moved by the Transport sector sharply influenced by the rate of growth of industry in industrial countries. This tendency can be seen in the case of rail transport from an examination of the data in Table 5-9 and the summary regression below:

Table 5-9 The growth of Rail Transport and Industrial output O.E.C.D. countries

Country	Period	Growth of Rail Transport, % of per year	Growth of Industrial output, % per year
		q_{rail}	$q_{manufacturing}$
Canada	1950-1965	2.84	6.07
West Germany	1950-1965	2.18	8.26
Norway	1950-1965	1.84	4.36
Denmark	1950-1965	1.06	4.58
United States	1950-1965	0.91	3.87
Belgium	1953-1965	0.38	4.61
United Kingdom	1950-1965	-0.77	3.13

Summary regression:

$$q_{rail} = \underset{(1.14)}{-1.37} + \underset{(0.218)}{0.517}q_{manufacturing} \qquad r^2 = 0.530, \; n = 7$$

Source: T.P. Hill (31) Table III pages 62-63

On the basis of this equation and the 5.1% growth rate of New Zealand Agriculture and Manufacturing, a 1.2% rate of growth of rail transport would be expected. The actual rate[1] was 2.3%, which is somewhat higher.

This rapid growth of rail transport in New Zealand, which is higher than that of any other country except Germany, is likely to be, at least in part, a consequence of New Zealand legislation which severely restricts the long-haul transport of goods by road. This has meant that the rapid relative decline of rail transport in favour of road transport characteristic of most industrial countries, had not taken place in New Zealand[2].

A similar relationship would also be expected for road-goods transport and the freight services of airlines, but good international data to test this contention is not published separately.

There is a tendency for the growth of Transport and Communication as a whole to be related to the growth of manufacturing output, this tendency arising in part through the genuine output complementary of rail and road transport already discussed, and in part through an income effect where passenger transport, particularly by air, is involved. This general tendency can be seen from the international data in Table 5-10 and the regression equation beneath.

On the basis of this equation and given the 5.1% rate of growth of Agriculture and Manufacturing, a 4.5% rate of growth of Transport and Communication would be expected in New Zealand, which is exactly the rate that did occur.

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(1) Calculated from Gillion and Frankels' data, op. cit., page 51.

(2) The characteristics of the Transport Sector in New Zealand are examined in some detail in Chapter 6.

Table 5-10 The growth of Transport and Communication[1], and Industry, 11 O.E.C.D. countries

Country	Growth of Transport and Communication % per year q_{tc}	Growth of Manufacturing, % per year, q_m
Japan	9.6	13.5
Italy	6.8	7.9
Norway	6.2	4.3
Netherlands	5.8	5.9
Austria	5.1	5.2
West Germany	4.8	8.4
Canada	4.5	5.2
New Zealand	4.5	5.1
France	3.6	5.8
United States	3.6	3.8
Belgium	3.5	4.8
United Kingdom	2.2	3.3

Summary regression:

$$q_{tc} = \underset{(0.84)}{1.53} + \underset{(0.126)}{0.578}q_m \qquad r^2 = 0.676, \quad n = 12$$

1. For years covered, see Table 5-5.

Source:

q_{tc} : calculated from data in O.E.C.D. National Accounts, 1953-1969 (75).

q_m : Table 3-2

Other Services, both Public and Private: the growth of output

The only sector which remains to be considered is that designated as Other Services, both Public and Private. This sector, more than any other, presents severe problems where estimation of the rate of growth of real output is concerned, this difficulty arising in part from the great many disparate activities which are included within the sector[1].

While the problem of having many different activities can in principle be dealt with by using a large number of indicators - in compiling the U.K. index of industrial production, for example, nearly 900 separate indicators are used[2] - there is a considerable problem in practice in obtaining suitable indicators for all the activities in the Other Services sector. Frequently the procedure that is adopted is to take the rate of growth of employment as the basic indicator, with some additional assumption being made about the rate of growth of labour productivity, although some countries, the U.K. being a notable example, also incorporate physical measures of output for the activities where this proves possible[3]. The precise assumption that is made about the rate of growth of productivity can have quantitatively important effects, and these are examined in detail in the next chapter.

For the purpose of completing the Service sector's accounts, it is assumed in Table 5-11 that the rate of growth of output in "Other Services, both Public and Private" is exactly the same as the rate of growth of employment in that sector. This rate was 2.8% per year over the period[4],

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(1) See the introduction to this chapter.

(2) U.K. Central Statistical Office (96), page 5.

(3) U.K. Central Statistical Office (96), Appendix II.

(4) See Appendix 2 to Chapter 7.

and so for the purpose of this chapter that rate will be taken as representing the rate of growth of output. This assumption will be changed in the next to examine the effects that alternative assumptions would have on the estimated rate of growth of output in the sector as well as on the estimated rate of growth of G.D.P. as a whole[1].

Table 5-11 Index of employment growth and value of G.D.P. originating in 1954/55 prices, in Other Services, both Public and Private

Production Year	Index of Employment 1954/55 = 100.0	Value of G.D.P. originating 1954/55 prices, $m.
1954/55	100.0	232
1955/56	101.0	234
1956/57	103.7	241
1957/58	106.4	247
1958/59	108.7	252
1959/60	111.7	259
1960/61	114.7	266
1961/62	117.9	274
1962/63	122.1	283
1963/64	126.4	293
1964/65	130.6	303
1965/66	136.4	316
	(1)	(2)

Column 1: Basic data source New Zealand Department of Statistics "Prices Wages and Labour". (68). Converted to a production year basis by Gillion and Frankel (23), Table 31, page 56, from which this index was derived, as the sum of rows 42 and 43 plus Government Service employment and Personal Service employment.

2: Base-year G.D.P.-originating of $m232 taken from Appendix 3 to Chapter 7, x column 1/100. The mean exponential rate of growth of columns 1 and 2 is 2.8% per year.

(1) A similar assumption has already been made in this chapter concerning the rate of growth of Banking and Finance.

The Service sector in aggregate: the growth of output

In this section the value in constant 1954/55 price of G.D.P. originating in Distribution, Banking and Finance, Transport and Communication, and Other Services is added together to provide the value in constant prices of the G.D.P. originating within the Services sector as a whole. The growth rate of the output of the Sector is then calculated, this procedure being equivalent to calculating the sum of the growth rates of each of the components, each sector being weighted by its proportionate 1954/55 contribution to G.D.P. This exercise is carried out in Table 5-12.

Table 5-12 Value of G.D.P. originating, constant 1954/55 prices, in each of the industry-groups of the Service Sector, New Zealand

	Commerce	Banking and Finance	Transport and Communication	Other Services	Total
1954	380	54	194	232	860
1955	389	55	203	234	881
1956	390	56	209	241	896
1957	407	58	210	247	922
1958	397	59	216	252	924
1959	404	61	223	259	947
1960	436	62	234	266	998
1961	459	64	246	274	1043
1962	477	67	246	283	1073
1963	521	69	265	293	1235
1964	561	74	297	303	1148
1965	581	79	319	316	1295
	(1)	(2)	(3)	(4)	(5)

Sources: Column 1: Table 5-4
2: Table 5-7
3: Table 5-8
4: Table 5-12

The mean rate of growth of column 5 is 3.7% per year

The index of real G.D.P. for the Services sector as a whole in Table 5-12 can be compared with the official aggregate index for the sector as a whole. This comparison is carried out in Table 5-13 below.

Table 5-13 Official index of production for the All Services group and the index derived in Chapter 5.

	Index derived in this chapter 1954 = 100.0	Official Index 1954 = 100.0
1954	100.0	100.0
1955	102.4	103.2
1956	104.2	105.2
1957	107.2	109.6
1958	107.4	110.4
1959	110.1	114.2
1960	116.0	120.8
1961	121.3	124.8
1962	124.8	127.5
1963	133.5	135.5
1964	143.6	141.1
1965	150.6	146.6
	(1)	(2)

Sources:

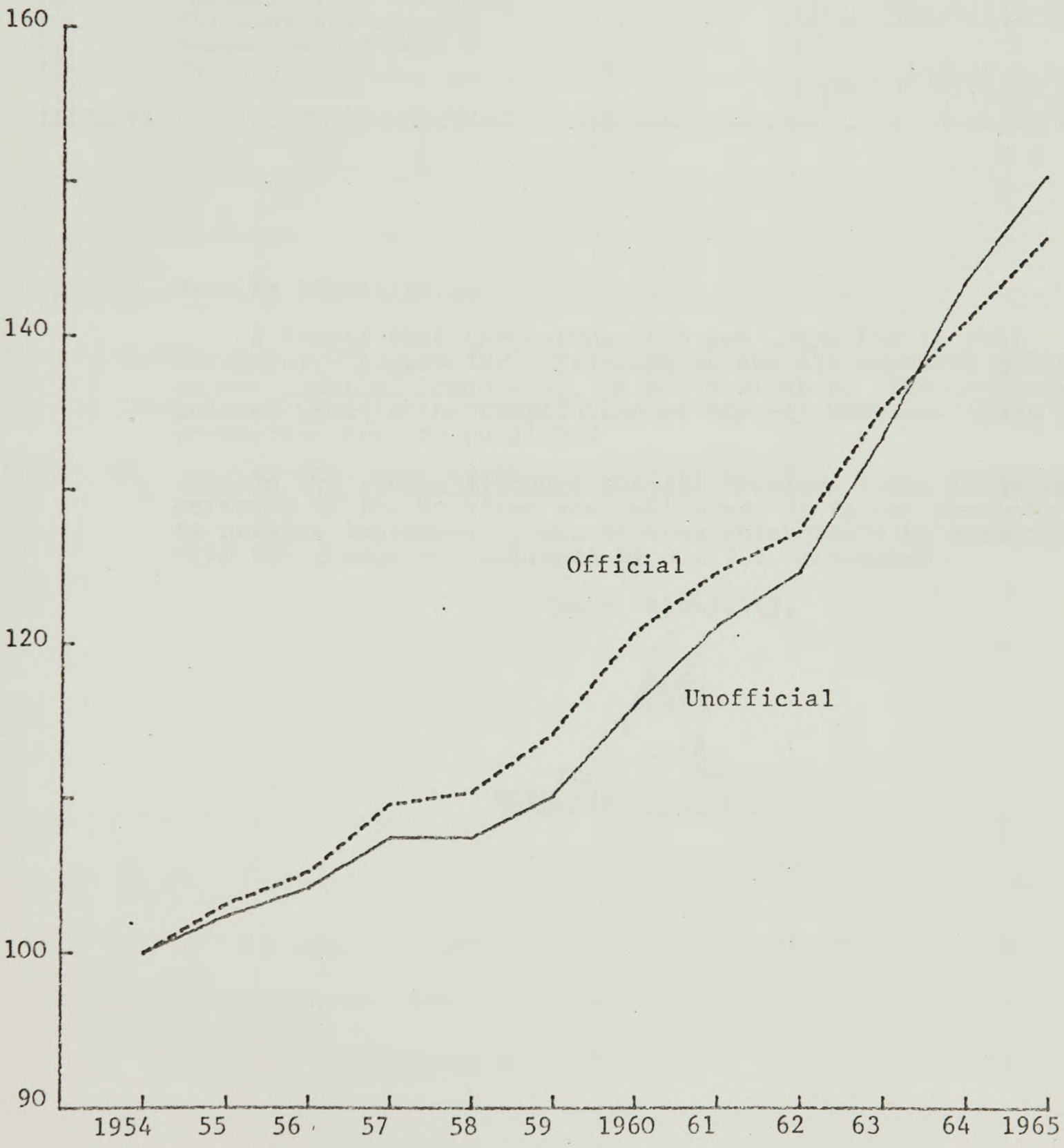
Column 1: Table 5-13

2: "Indexes of Production and Productivity" (62).

The Growth of Output in the Services sector : conclusions

The comparison of the index of Service sector output derived from information on the five subdivisions of the Services sector with the official aggregate index shows that the two behave quite similarly, the overall rate of growth of the two series being almost identical. The official index grows slightly faster up to 1963, and the index derived in this chapter grows slightly faster thereafter - the relative movement of the two series is shown in Chart 5.1. It must be emphasised, however, that the rate of growth of output in the 'Other Services' component of the Services sector was calculated in this chapter on the conservative assumption that the rate equalled the rate of growth of employment. In view of the fact that in most O.E.C.D. countries a positive rate of growth of labour productivity in 'Other Services' is assumed, it follows that had such an assumption been made in this chapter, the resulting aggregate index for the services sector as a whole would have grown faster than the official index. The implications of this are examined in the next chapter, which examines the growth of employment and labour productivity in the Services sector.

Chart 5-1 The official "All Services" output index, and the index derived in this Chapter



Index derived in this Chapter

Official Index

Appendix Table 5-1.

TELEGRAPHIC ADDRESS:
"STATISTICS, WELLINGTON."
TELEPHONE 70-599

LETTERS TO BE ADDRESSED:
THE GOVERNMENT STATISTICIAN,
PRIVATE BAG,
WELLINGTON C.1, NEW ZEALAND.

Department of Statistics

Mr G.E.J. Llewellyn,
Department of Applied Economics,
University of Cambridge,
Sidgwick Avenue,
Cambridge CB3 9DE,
ENGLAND.

IN REPLY PLEASE QUOTE:
STATS. 17/5/341

24 August 1972

Dear Mr Llewellyn,

I regret that the information you asked for in your letter of 7 August 1972, relating to the All Services group of the Index of Production, is not available. The component indexes used in the compilation of the All Services index of production are not published

In any event, although the All Services index includes coverage of the services you mentioned, it is not possible to provide individual group indexes which would be comparable with the groups as published by O.E.C.D. countries.

Yours faithfully,

Coley

(L. Coley)
for J.P. Lewin
GOVERNMENT STATISTICIAN

Introduction

The previous chapter was concerned with estimating the rate of growth of output of each of the five industry-groups into which the Service sector is characteristically sub-divided. These five industry-groups are Transport and Communication, Wholesale and Retail Trade, Banking and Finance, Community Personal and Social Services, and Activities not adequately defined. The last three industry-groups will frequently be considered together in this chapter, and will be designated simply "Other Services".

It was found in the previous chapter that the rate of growth of Transport and Communication (ISIC 7) was in line with the experience of other high-per-capita countries. The rate of growth of Wholesale and Retail Trade (Commerce (ISIC 6)) was, however, somewhat lower than would be expected on the basis of international experience and the 5.1% rate of growth of industrial and agricultural output. The rate of growth of output in Banking and Finance, Community Personal and Social Services, and Activities not adequately defined (ISIC groups 8, 9 and 0) was assumed in the last chapter to be equal in each case to the rate of growth of employment. It was found that the resulting aggregate index for the Service sector exhibited almost exactly the same rate of growth as the official "All Services" index, from which it was concluded that the official index attributes zero or even possibly slightly negative productivity growth to the labour engaged in Banking, Finance, and the various other service activities which are designated as "Other Services" in this chapter and which together produce over 12% of total G.D.P.[1]

The purpose of this chapter is two-fold. Firstly, the rate of growth of employment in Wholesale and Retail Trade and in Transport and Communication is examined to see whether, on international experience, the rate of employment

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(1) In 1954/55 G.D.P. originating in ISIC activities 9 and 0 was £m 232, and total G.D.P. was £m 1877: See Appendix Table 3 to Chapter 7.

growth was high or low in relation to the rate of growth of output. The second purpose of the chapter is to investigate the possible sources of labour productivity growth in those service activities where, in the last chapter, output was deemed to grow at the same rate as employment.

Wholesale and Retail Trade - the growth of employment and productivity

In New Zealand, as in other high-per-capita income countries, a large proportion of the total labour force is employed in Wholesale and Retail trade (hereafter referred to as Commerce). In New Zealand in 1954/55, the beginning of the period under examination, 117,000 people (14.7% of the labour force)[1] were engaged in Commerce, compared with 130,000 in Farming and 189,000 in Manufacturing. By 1965/66 the numbers were 150,000 in Commerce (14.9%), 124,000 in Farming (12.3%), and 268,000 in Manufacturing (27%). To have such a proportion of the labour force engaged in Commerce is quite typical of high-per-capita-income countries: Table 6-1 gives the equivalent proportions for a number of O.E.C.D. countries for the years nearest to 1954/55 and 1965/66 for which data is available. While the coverage of the data for the beginning and end years is not quite the same (due to a classification change), and while the New Zealand definition is slightly different from the O.E.C.D. definition[2], the numerical consequences of these differences are quite small. It can be seen from the table that in the majority of countries the proportion of the labour force engaged in Commerce lies in the 14-15% range, and that this proportion has not changed markedly over the 1950's and 1960's.

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(1) See Appendix Table 2 to Chapter 7.

(2) See the footnote to Table 6-1 for an elaboration of these points.

Table 6-1 The proportion[1] of the total employment engaged in Commerce New Zealand and various O.E.C.D. countries, various years.

Country	Proportion engaged in Commerce %			
Canada	19.0	(1954)	16.5	(1966)
Japan	17.1	(1954)	19.2	(1967)
Austria	N.A.		14.4	(1969)
Belgium	14.1	(1954)	12.8	(1966)
Denmark	14.6	(1959)	15.3	(1965)
France	11.8	(1954)	14.9	(1966)
West Germany	14.4	(1962)	14.8	(1966)
Italy	12.3	(1959)	13.6	(1967)
Netherlands	15.1	(1954)	17.7	(1967)
New Zealand	14.7	(1954/55)	14.9	(1965/66)
Norway	11.8	(1954)	15.0	(1966)
United Kingdom	14.2	(1954)	13.5	(1966)

Sources: All countries except New Zealand: "Manpower Statistics 1950-1962" (74) and "Labour Force Statistics 1959-1970" (72).

New Zealand: See Appendix Table 2 to Chapter 7.

(1) Data taken for the early years from the publication "Manpower Statistics 1950-62"(74) is not quite comparable with the data for the later years taken from "Labour Force Statistics 1959-1970"(72), because of minor reclassification changes in the New ISIC heading number 6. The differences in coverage are, however, relatively minor. A further complication is introduced by the fact that the O.E.C.D. data refers to civilian employment, whereas the New Zealand data refers to total employment. The error introduced by the different coverage of the New Zealand data is small, however, because of the relatively small size of the Armed Forces in New Zealand over the post-war period.

Commerce is therefore quantitatively important, in terms of the proportion of total G.D.P. originating within the sector (which was examined in Chapter 5) and in terms of employment, so that the rate at which labour productivity grows in the sector has a marked effect on the rate of productivity growth in the economy as a whole. Employment in Commerce grew over the period 1954/55 to 1965/66 at a mean exponential rate of 2.3%[(1)] per year which, given the rate of output growth of 3.9% per year obtained in the previous chapter, means that productivity grew at 1.6% per year. In international comparison this is quite low[(2)], being exceeded by all countries in Table 6-2 except Belgium, the United Kingdom and Canada[(3)].

A simple comparison with the average behaviour of other countries does not, however, bring out the full characteristics of the way in which Commerce productivity growth in New Zealand compares with productivity growth in Commerce in other countries. If international data on the rate of productivity growth in Manufacturing is included in the examination as well, an interesting fact emerges, which is that countries which have rapidly-growing labour productivity in Manufacturing also have rapid productivity growth in Commerce. This can be seen by examining the data in columns 1 and 2 of Table 6-2, and from the summary regression equation which relates the two variables, thus:

$$p_{commerce} = \underset{(1.02)}{-2.12} + \underset{(0.228)}{1.163}\, p_{manufacturing} \qquad r^2 = 0.753,\ n = 11 \quad (4)$$

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(1) Calculated from data in Appendix Table 3 to Chapter 7.

(2) See Table 6-2

(3) Furthermore, the Canadian figure, which indicates negative productivity growth in Commerce, is very hard to believe. This may be the result of error in the compilation of the index of output for Canada, which is discussed in Chapter 7.

(4) As in all other summary regression equations in this thesis, the cross-country relationship is estimated excluding New Zealand, since it would be inappropriate to include New Zealand data when estimating a general relationship with which New Zealand is then to be compared.

Table 6-2 The rate of growth of labour productivity in Commerce and Manufacturing, various countries

Country	Period	Productivity Growth Rate % per year	
		Commerce	Manufacturing
Japan	1953-1964	7.3	8.0
Austria	1951-1966	4.3	4.0
West Germany	1951-1965	3.8	4.7
Netherlands	1951-1965	3.4	4.3
Italy	1951-1963	3.2	5.1
France	1951-1964	2.5	4.4
Norway	1951-1965	2.1	3.6
United States	1951-1966	1.9	2.8
New Zealand	1954-1965	1.6	3.2
Belgium	1951-1964	1.4	4.2
United Kingdom	1951-1965	1.4	2.5
Canada	1951-1966	-0.6	2.9
		(1)	(2)

Source: (1) All countries except New Zealand: Output data from "National Accounts of O.E.C.D. countries 1953-1968" (75).
Employment data from "Manpower Statistics 1950-1962" (74) and from "Labour Force Statistics 1959-1970" (72).

New Zealand: Output data in Appendix Table 3 to Chapter 7 and employment data from Appendix Table 2 to Chapter 7.

(2) Table 3-1 (Chapter 3)

The equation indicates the systematic tendency for the rate of Commerce productivity to be higher in those countries where the rate of growth of manufacturing productivity is high. Possible reasons for this phenomenon are discussed below. The immediate implication of the equation is that, given the relatively low rate of productivity growth in New Zealand manufacturing industry[1], the low rate of productivity growth in Commerce in New Zealand is not necessarily as much out of line with international experience as a simple comparison of Commerce productivity growth rates would suggest. Indeed, the equation suggests that, associated with the productivity growth rate of 3.2% per year in New Zealand manufacturing, would be a productivity growth rate of 1.6% per year in New Zealand Commerce, and this is exactly the rate at which productivity did grow. In this respect, therefore, the New Zealand experience conforms with general international experience.

Thus productivity growth in Commerce in a number of countries, including New Zealand, is quite systematic in behaviour and warrants explanation. General reasons why Commerce productivity should increase in the long run are not hard to find. Reddaway (81), for example, writing about the United Kingdom in the First Report of the Selective Employment Tax, stated that:

> "....there is a reasonable expectation that productivity[2] will show an upward trend over any period of a decade or more, reflecting the introduction of improved methods[3], sometimes involving additional capital per worker."

If these two sources of labour productivity growth[4] are taken as the most

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(1) Discussed in Chapter 3.

(2) Labour productivity in Wholesale and Retail Trade.

(3) Reddaway (81), page 83.

(4) It cannot be emphasised too strongly here that while the concern is to understand how increases in the volume of sales (throughput) per employee come about, it is recognized that such increases need not be matched by an equivalent increase in welfare, which may have decreased through a decline in the quality of service. This distinction, between the growth of productivity and 'economic welfare', as it has recently been called, has been discussed at length in the previous chapter.

likely sources, the interesting question is the extent to which each of the two phenomena contributes to a systematic explanation of the international data. Empirical investigation of this question runs into difficulties, however. Capital stock data compiled on a uniform basis is not available for Commerce in most countries, so that it is not possible to examine accurately the extent to which differences in the rate of growth of capital per worker in this sector could explain variations in the rate of productivity growth. Some data on gross investment is published by the O.E.C.D. for some of its member countries, but the accuracy of this data is questionable. The issue of the importance of capital accumulation for labour productivity must therefore remain open for the present. But it should be noted that even if it were to be found that differences in the rate of Commerce productivity growth could be explained by differences in the rate of capital accumulation, it would still be necessary to explain why there has been a systematic tendency for countries with rapid industrial productivity growth to have high rates of capital accumulation in Commerce.

An examination of the detailed Commerce data made available by the quinquennial censuses of Distribution in New Zealand does however offer some insight into the process of labour productivity growth in Commerce. As Table 5-3 shows, the average earnings[1] per employee in Retail Trade grew quite steadily between 1953 and 1963 at a mean exponential rate of 2.4% per annum, and somewhat faster (5.2%) between 1963 and 1968. The mean overall rate of growth of average earnings was 3.3% per year.

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(1) The index of earnings/employee given in Table 6-3 is not conceptually the same as an index of wage rates, because the effects of wage drift and changing composition are incorporated in the Table 6-3 index. For present purposes it is appropriate to include drift and composition effects, because it is overall labour cost that is being considered.

In New Zealand the process of wage growth is highly institutionalized. The Court of Arbitration grants annual increases in the minimum wage which must at least be met by all employers, and by custom which is reinforced by the existence of continuous full employment, employers in all sectors increase their employees' wages by the proportionate amount of the increase in the award rate, so that in New Zealand, as in most other developed countries, wage differentials between major sectors change only very slowly.

The general price of wholesale goods, which it is the purpose of the Retail sector to distribute, grew in a similar manner; the growth was fairly smooth between 1953 and 1963, at a mean rate of 1.1% per year, and thereafter prices grew somewhat faster, at 3.4% per year. The mean overall rate of growth was 1.8% per year. It follows from these two pairs of growth rate statistics that if Retailers' margins, defined as the ratio of the value of sales to the value of purchased inputs other than labour had been constant, and if employment had been growing at the same rate as the value of sales, then Retailers' profits would have been growing less fast than the wages they were paying to their employees; in other words, the Retailers' profit share would have been declining. In such circumstances Retailers could be expected to seek to reduce their costs, through substituting capital for labour as labour becomes relatively more expensive, or by introducing changed methods of organisation, or both. The actual cost picture is not quite as straightforward as that, because, as can be seen in Table 6-3, Retailers did increase their margins over the period. But the rate of increase was very low - far too low to make it unnecessary for Retailers to economise on the use of labour. Between 1953 and 1963, wholesale prices rose at a mean rate of 1.1% per year, and margins at 0.5% : the sum of these rates, 1.6%, is less than the rate of growth of average earnings over the period (2.4% per year) so that it was necessary, if the profit share was to be maintained, for employment to grow less fast than the volume of sales. Similarly, between 1963 and 1968, wholesale prices grew at 3.4% per year, margins at 0.2% per year, and wages at 5.2% per year, the price-cost

differential increasing to 1.6% per year.

There are two ways of interpreting this cost picture, and the interpretations have markedly different implications for the direction of causality in the growth of labour productivity in Commerce. It could be that retailers are perfect competitors, with each retailer earning normal profits and no more. If technical progress or other cost-reducing phenomenon occurred in such a world, the potential threat of new entrants would cause retailers to lower their prices, in this case their margins, in relation to the costs of their inputs. This could be the explanation of what has taken place in New Zealand, although, if it is, it is interesting that the rate of cost-reducing progress has been just sufficient to offset the rise in costs, for margins have remained virtually constant.

The alternative explanation is that retailers are imperfect competitors, each being a substitute but not a perfect substitute for his rival, so that retailers charge a markup price (margin) the magnitude of which is determined by the elasticity of demand for their product. In such a circumstance retailers faced by an increase in wage costs relative to the prices of purchased inputs, would not, to the extent that some of their labour is an overhead cost, raise their price (margin), for this is already appropriately set for the given demand conditions. They would choose instead to substitute capital for overhead labour, and would seek with renewed vigour to indulge in improved techniques of production. If, however, all labour is a variable cost, this second explanation does not work; any increase in labour costs would be an increase in marginal costs and would automatically be covered, because under this assumption wages are marked up on. However, to the extent that wages are in part a fixed cost, a rise in the relative cost of labour will tend to lower profit, and hence labour will be economised.

Table 6-3 The cost structure of New Zealand Retailing, 1953 to 1968

		1953	1958	1963	1968
Wage Bill $ x 10^3	1.	75,769	103,018	124,840	181,140
Number of Employees	2.	71,030	85,784	92,477	103,254
Wage Rate, 1953 = 100.0	3.	100.0	112.6	126.6	164.5
Wholesale prices	4.	100.0	108.2	111.3	131.8
Value of net Purchases $ x 10^6	5.	624.7	919.1	1157.9	1598.7
Value of Sales $ x 10^6	6.	808.0	1197.6	1515.9	2099.7
Gross Margin, %	7.	29.3	30.3	30.9	31.3
Gross Margin, index		100.0	103.4	105.5	106.8

	Rates of Growth, % per year		
	1953-1967	1963-1968	1953-1968
Wage rate	2.4	5.2	3.3
Wholesale prices	1.1	3.4	1.8
Gross Margin	0.5	0.2	0.4

Sources:
(1) New Zealand Department CEnsuses of Distribution for 1953 (56), 1958 (57), 1963 (58), 1968 (59).
(2) Wholesale Price Index from 1971 New Zealand Year Book (67), page 939.

Row 3 = Row (1) / Row 2 scaled to 1953 = 100.0

Row 7 = [1 - (Row 6 / Row 5)] x 100

The crucial difference between the two explanations of the observed behaviour is that in the first, increases in labour productivity are exogenous to the Commerce sector, whereas in the second increasing labour productivity is induced by the rising level of real wages. To the extent that this model does represent the behaviour of the Retailing sector and to the extent that margins are constant in other countries, then the correlation noted in Table 6-2 is understandable, for it is the countries that have the most rapid increase in industrial productivity that have the most rapid increase of money wages relative to wholesale prices.

Certainly there was in New Zealand over the period in question considerable scope for substituting capital for labour and indulging in changed methods of retailing. The process of switching to supermarket selling has permitted the substitution of capital for labour to take place in all industrial countries, so that with the attendant organisational change that has taken place a steadily rising volume of throughput per person engaged has been achieved. In New Zealand at the start of the period in question this process had not developed very far. In retail grocery shops, for example, only 33.2% of sales in 1958 occurred in shops with self-service units. By 1963 this ratio had risen to 54.3%, and by 1968 to 64.4%[1].

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(1) Ratios calculated from Data in 1958 Census of Distribution (57) Table 17, 1963 Census of Distribution (58) Table 18, and 1968 Census of Distribution, (59), Table 18.

Transport and Communication - the growth of employment and productivity

In terms of employment, Transport and Communication in New Zealand is slightly more than half the size of Commerce, employing 80,000 people in 1954 (10.1% of the labour force) and 99,000 in 1965 (9.8% of the labour force)(1). Road transport is the largest employer (30,000 in 1965) followed by Communications (27,000), shipping (21,000), Railways (16,000) and Air transport (5,000(2).

While all the various types of transport activity - shipping, air transport, rail and road services - are found in New Zealand, the distinctive features are the extensiveness of the air transport system and the fact that, in contrast to the situation in most high per-capita income countries, the railway system is expanding in terms of the volume of goods carried(3). The basic characteristics of the transport system as a whole are as follows.

The nationalised railway system extends over 3,000 route miles and links most of the cities and large towns. Over the period 1954/55 to 1965/66 there was a steady decline in the proportion of total rail traffic moved by steam locomotion, from over half to about a quarter(4). Correspondingly there was a steady increase in the importance of diesel locomotion, which by 1965/66 accounted for over 60% of total traffic.

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(1) Calculated from data presented in Appendix Table 2 to Chapter 7.

(2) Data taken from "Prices, Wages, and Labour". (68).

(3) Although in 1954/55 there were 3,489 miles of track open for traffic, a figure which by 1965/66 had fallen slightly to 3,251 miles, over the same period the number of rail passenger journeys increased from 14.42 million to 15.43 million, and the tonnage of goods moved rose from 10.34 million tons to 11.89 million tons (see 1971 New Zealand Year Book, Statistical Summary, page 1050).

(4) See 1971 New Zealand Year Book (67) page 311. Since 1965/66 the proportion of total rail traffic moved by steam power has dropped even further, virtually to zero.

There is an overlap of ownership between the railways and the road service system, for the nationalised railway system also operates a fleet of buses over a route system which has been virtually constant in length over the period[1]. Over this period, there has been steady growth in the number of passenger journeys, from 19,271 thousand in 1956 to 22,297 in 1965[2], while there was a decrease in the number of passenger vehicles responsible for the traffic from 763 to 729.

The Railways also operated a fleet of goods vehicles, which together with the goods vehicles operated by the private sector have experienced steadily-rising output, both in total and per vehicle[3]. These vehicles have been responsible for shifting a large proportion of the output from, and inputs to, the farming sector, and so demand for goods vehicle services has risen as agricultural output has grown. Urban passenger transport is in large part operated by local authorities, for which data is published, although private enterprise is also important in some areas, such as the South Auckland area which is entirely served by private bus companies. (See 1971 N.Z. Year Book page 317 and earlier Year-books).

The largest air transport operator is a nationalised corporation which operates a network which links all the major centres. Secondary services are provided by a number of small operators, many of which specialise in transit traffic to and from resorts which are not readily accessible by road. A number of companies also provide air-freight services.

Transport is an activity which, like much of manufacturing, offers considerable scope for economies of scale, and a wide range of techniques is

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(1) The number of route miles was 5,842 in 1955/56 and 5,858 in 1965/66 (see New Zealand Year Book 1971, page 316).

(2) 1965 in fact represented the peak year for the Railways Road Services; the number of passenger journeys thereafter declined slightly until 1970 and then started to increase again.

(3) See, for example, 1971 N.Z. Year Book (67) at page 321 and earlier editions.

frequently observed in simultaneous operation. On air routes which move relatively small numbers of people, small planes, each necessarily with a pilot and a stewardess, are used. On more densely-used routes, larger planes can be used, with many more people being carried without a proportionate increase in transport employment. Railway and road transport are also subject to considerable increasing returns. Labour productivity growth is therefore determined in large part by the rate of growth of load size: as was noted above, much of the road and rail transport in New Zealand is concerned with moving agricultural produce from numerous farms to the ports, and with moving imported and manufactured goods in the reverse direction from the ports and the major cities to farms. As the average size of each load increases through time, the size of trucks, the length of trains and the capacity of aircraft can be expected to increase with a consequent increase in labour productivity.

It was seen in the previous chapter that the rate of growth of Transport and Communication output, 4.5% per year, was almost exactly what would have been expected on international experience, given the rate of growth of agricultural and industrial output of 5.1% per year. Over the period, employment in Transport and Communication grew at 1.9% per year, so that productivity grew at 2.6% per year. In international comparison this rate is low, being exceeded by all the O.E.C.D. countries except France, and being 1.2 percentage points below the mean - see column 1 of Table 6.4 below. It is a particularly interesting characteristic of Transport and Communication that there is apparently no tendency for labour productivity to be more rapid in those countries in which the rate of growth of industrial productivity is high. In Norway, for example, where the rate of industrial productivity growth was 0.6 points below the mean for O.E.C.D. countries, the rate of productivity growth was the second highest, 1.2 points above the mean. And in France, productivity growth in Transport and Communication was

Table 6-4 The rate of growth of labour productivity in Transport and Communication, and Manufacturing, various countries

Country	Period	Rate of growth of labour productivity, % per year	
		Transport and Communication	Manufacturing
Japan	1953-1964	5.8	8.0
Norway	1951-1965	5.0	3.6
Netherlands	1951-1965	4.8	4.3
West Germany	1951-1965	4.3	4.7
United States	1951-1966	3.9	2.8
Austria	1951-1966	3.8	4.0
Canada	1951-1966	3.5	2.9
Belgium	1951-1964	3.2	4.2
Italy	1951-1963	2.7	5.1
United Kingdom	1951-1965	2.7	2.5
New Zealand	1954-1965	2.6	3.2
to France	1951-1964	1.7	4.4
Mean, excluding New Zealand		3.8	4.2

Sources: Column 1: Output data for all countries except New Zealand "National accounts of O.E.C.D. countries 1950-68" (75), and employment data from "Manpower Statistics" (74).
New Zealand growth rates calculated from data in Appendix Tables 1 and 2 to Chapter 7.

Column 2: Taken from Table 3.1, Chapter 3.

slower than in any other country, including New Zealand, whereas the rate of industrial productivity growth was above average. The absence of any overall relationship is indicated by the regression equation[1]

$$P_{\text{transport and communication}} = \underset{(1.0)}{2.3} + \underset{(0.235)}{0.354}\, P_{\text{manufacturing}} \qquad r^2 = 0.201, \quad n = 1$$

in which the value of r^2 is low and the value of the coefficient is statistically insignificant. Such behaviour, therefore, does not provide a reference against which the New Zealand performance can be assessed.

There is, however, one quite systematic feature of Transport and Communication, and that is the tendency for the rate of growth of employment to be the more rapid, the higher is the rate of growth of output. This tendency can be seen from the data in Table 6.5, and from the regression equation beneath, which indicates that the additional labour is characteristically proportionately less than the increase in output, an additional 1% increase in the output growth rate typically being associated with an extra 0.6% increase in employment. In this respect, therefore, the behaviour of Transport and Communication is similar to the behaviour of industry, where characteristically extra output growth is associated with additional employment growth (although less than proportionately), and quite unlike Commerce, where firstly there is no tendency for rapid output growth to be associated with rapid employment growth, and secondly where there is a tendency for productivity growth to be more rapid when the rate of industrial productivity growth is high.

The regression equation beneath Table 6.5 can be manipulated so as to derive an expression for the rate of growth of productivity, which then

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(1) As always, for reasons stated above, estimated excluding New Zealand.

Table 6-5 Rate of growth of output and employment in Transport and Communication, various countries

Country	Period	Rate of growth, Z per year	
		Output, q	Employment e
Japan	1953-1964	9.6	3.8
Italy	1951-1963	6.8	4.1
Norway	1951-1965	6.2	1.3
Netherlands	1951-1965	5.8	1.1
Austria	1951-1966	5.1	1.3
Canada	1951-1966	4.5	1.0
New Zealand (1)	1954-1965	4.5	1.9
United States	1951-1966	3.6	-0.3
France	1951-1964	3.6	2.0
Belgium	1951-1964	3.5	0.3
United Kingdom	1951-1965	2.2	-0.4

Summary Regression

$$e = \underset{(0.77)}{-1.7} + \underset{(0.142)}{0.594}\, q \qquad r^2 = 0.660 \qquad n = 11$$

Sources:

All countries except New Zealand: output: calculated from data in "National Accounts of O.E.C.D. countries 1953-1962" (74) and "Labour Force Statistics, 1959-1970" (72).

New Zealand: calculated from data in Appendices 2 and 3 to Chapter 7.

(1) As in all other summary regressions, New Zealand data was not included, so as to avoid making a subsequent comparison between New Zealand behaviour and a relationship which was derived in part from New Zealand behaviour.

permits an assessment of New Zealand's performance. Changing signs in the equation and adding q, the rate of growth of output, to both sides gives

$$q - e = 1.70 + 0.406q ,$$

where p is the rate of growth of labour productivity. This equation predicts that given the 4.5% rate of growth of Transport and Communication output, a 3.5% rate of growth of labour productivity would result. This is somewhat higher than the actual rate of 2.6%, suggesting that in Transport and Communication, as in industry, the rate of growth of labour productivity was, in comparison with international experience, somewhat lower than would be expected. It must be emphasized, however, that while the employment equation from which the productivity equation was derived does show the broad characteristics of the international data, it is not a particularly well-determined equation and, specifically, it does not take into account the effects of variations in the rate of investment, which could account for much of the unresolved discrepancies between countries[1].

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(1) Good reliable data on investment in Transport and Communication is not available for very many countries, including New Zealand.

Productivity growth in Transport and Communication - Conclusions

The behaviour of Transport and Communication appears to be quite understandable in relation to the behaviour of other countries. The rate of growth of output, 4.5% per year, is just what would have been expected, given the 5.1% rate of growth of agricultural and industrial products which it is the function of transport to distribute. The rate of growth of employment of 1.9% leading to a 2.6% rate of growth of productivity, was a little higher than might be expected on international experience, but it is not possible to be certain that the rate of labour productivity growth was unduly low, because the rate of investment has not been taken into account.

Other Services

The study of productivity growth in this sector presents a severe conceptual problem. Whereas in all the other sectors of the economy the rate of growth of output is obtained from the evidence of physical output indicators, in the case of Other Services this is not possible. The output produced is not physical in nature; it cannot be weighted, or measured for length or volume. The procedure usually adopted by statisticians is instead to infer the rate of growth of output from the rate of growth of input, and the input which is most frequently used is employment, so that any discussion of labour productivity based on the evidence of employment and output data would be meaningless, the output data having been inferred from the employment data in the first place.

The problem of adequately representing the growth rate of Other Services is therefore considerable, yet it has to be dealt with because the sector is an important one. The sector employs 19.7% of the entire labour force[1], and as was shown in Chapter 5, produces 12.4% of measured G.D.P.[2]

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(1) In 1954/55 - see Appendix Table 2 to Chapter 7

(2) In 1954/55 - see Appendix Table 3 to Chapter 7.

It was assumed in the previous chapter, as an initial step to make it possible to complete the sectoral output accounts, that the rate of growth of output in Other Services was equal to the rate of growth of employment, it thereby being assumed that the rate of growth of labour productivity in Other Services was zero. It was then found that if the constant-price value of G.D.P. originating within Other Services obtained in this manner was added to the constant-price G.D.P. data for the various Other Service sector activities, the rate of growth of all the Services sector as a whole was the same as the rate of growth exhibited by the official index.

But the assumption of zero productivity growth in Other Services is arbitrary and unsatisfactory for some increase in labour productivity has almost certainly occurred in Other Services in New Zealand. The assumption of zero productivity growth therefore probably understates the true contribution of this sector and leads to a lower measured growth rate of total G.D.P. than ought to be the case. Secondly, virtually all other high per-capita-income countries, while recognising the difficulty of measuring the true rate of output growth in Other Services, attribute positive productivity growth in this sector. The consequence is that the rate of growth of Service sector output and hence of total G.D.P. in New Zealand is measured as being lower than would be the case if customary conventions were followed in New Zealand. These two matters are investigated below.

The growth of productivity in Other Services

While physical measures of output for many service activities have not been constructed and very likely cannot be constructed, it would seem likely, considering the nature of many of these activities, that at least some growth of labour productivity has taken place over the years, sometimes through the substitution of capital for labour, and

sometimes through improved methods of organisation. In the provision of lodging accommodation and food, the installation of more modern cookers, cleaning equipment, and other machinery such as dish-washers will almost certainly have served to increase labour productivity.

Laundries and dry-cleaning establishments characteristically become bigger over time, installing larger and more automated equipment, and in the management of parks and reserves capital equipment such as tractors, mechanical wheelbarrows and automatic watering equipment is used more than used to be the case. In hospitals,medical centres and in dentistry, processes become more capital-intensive over time, and, in teaching the use of books, films and television spreads, increasing the effectiveness of teachers. In all activities such as this it would seem that an assumption of zero labour productivity growth would be an unreasonable one.

Yet at the same time it must be recognised that it is in the nature of many other service activities that what is being purchased is essentially the services of a man for an hour. To the extent that this is the case then, by definition, the rate of labour productivity growth truly is zero. Baumol's famous example of the horn quintet, while it is a very special case, illustrates this kind of service: what is essentially being purchased by a ticket for a live performance is the right to hear the stipulated number of players perform the work in question at the speed recommended by the composer. Any attempt to increase the players' 'efficiency' either by reducing their numbers or by increasing the rate at which they play, would be met with resistance and would not be deemed to be a genuine increase in productivity.

In the light of such arguments, it would perhaps seem reasonable to suppose that productivity growth has taken place in some parts of

the large Service sectors, but that the overall rate of growth of productivity has not been as high as in many of the other sectors.

Such a view would not, however, be shared by all those who are engaged in estimating the rate of growth of service-sector output and output per head. Table 6-6 below gives the rates of growth of measured output, employment and productivity in the Other Services sector _New ISIC divisions 8, 9 and 0_ for the various O.E.C.D. countries whose output and employment data can be appropriately subdivided(1). There are two extreme cases of particular interest; these are Germany and Canada. In Germany, the rate of growth of output in Other Services was measured as being 6.39% per year between 1962 and 1965, and 3.61% between 1965 and 1970. Taken in conjunction with employment growth rates in this sector of 1.83% and 1.93% over the same periods, this implies rates of productivity growth of 4.56% per year and 1.68% per year. The first of these two values would appear to be extremely high, and it is not clear why there should be such a discrepancy between this rate and the second rate, given that the two were obtained for adjacent periods of time.

At the opposite extreme is Canada, where measured output in Other Services grew at 5.08% per year between 1961 and 1966 and 4.70% per year between 1966 and 1970. Taken in conjunction with employment growth rates of 5.58% and 5.24%, this output data implies negative productivity growth in both periods, at rates of 0.50 and 0.54 per cent per year. This result is on the face of it particularly odd, for it is hard to imagine that the productivity of any employee actually fell over the period, and it is very hard indeed to believe that the overall level of

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(1) The procedures involved in obtaining these figures are described in detail in Appendix 1 to Chapter 7.

Table 6-6 Rate of growth of output, employment, and productivity in Other Services New ISIC divisions 8, 9 and O, various countries

Country	Period	Mean exponential Rates of Growth, % per year		
		Output	Employment	Productivity
West Germany	1962-1965	6.39	1.83	4.56
	1965-1970	3.61	1.93	1.68
France	1964-1969	5.25	3.57	1.68
Belgium	1964-1970	4.02	2.66	1.36
Italy	1959-1963	4.13	0.76	3.37
	1963-1970	4.31	1.64	2.67
Norway	1960-1965	4.29	2.74	1.55
	1965-1970	4.97	3.75	1.22
United Kingdom	1960-1965	2.41	2.34	0.07
	1965-1969	2.25	1.63	0.62
Canada	1961-1966	5.08	5.58	-0.50
	1966-1969	4.70	5.24	-0.54

Source: Calculated from output data in "National Accounts of O.E.C.D. countries 1960-1970" (75) and employment data published in "Labour Force Statistics 1959-1970", (72), reproduced in Appendix Table 1 to Chapter 7.

labour productivity declined. Various other countries are scattered between these extremes of high positive productivity growth and slight negative productivity growth. Thus there appears to be considerable variation in the extent to which different countries attribute productivity growth to Other Services.

It is informative that the United Kingdom, a country which probably more than any other has made a strenuous attempt to find physical indicators with which to represent the rate of growth of Service productivity, attributes a relatively low rate of productivity growth to this sector. Indicators used in the United Kingdom include the number of income tax assessments handled by accountants, a weighted average of various kinds of cases tried in Courts of Justice, the number of grants of probate, numbers of hospital and nursing home patients, the number of children inspected by the school medical service, a weighted average number of dental treatments, the number of admissions to cinemas, and a weighted average of radio and television licenses[1]. Despite this considerable ingenuity, it was apparently impossible to avoid, in a number of important instances, using employment as the indicator of output.

The growth of labour productivity in Other Services. Conclusions

It would appear, on the basis of a consideration of the type of activity carried out in this sector and on the United Kingdom evidence of the movement of various physical indicators, that labour productivity growth probably does take place in Other Services. It is unlikely, however, that the true rate is particularly high in any country, even if there is a

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(1) This list is not exhaustive - see C.S.O. "The index of industrial production and other output measures", (95), pages 30-31.

tendency for the rate to be higher in those countries which have experienced rapid productivity growth in the industrial sectors. Certainly no firm quantitative evidence has been produced by any country to show that a rate in excess of 1 or 2 per cent per year has been achieved. In the next chapter, this matter is taken one stage further. Two alternative assumptions are made about the true rate of growth of output in Other Services. The first assumption is that the true rate of growth of output equals the rate of growth of employment - that is, that the rate of growth of labour productivity is zero. The second assumption allows for the probability that the rate of productivity growth is more rapid in countries where industrial productivity grows rapidly. The precise assumption made is an extreme one, that the rate of growth of output equals the rate of growth of employment plus the rate of growth of productivity in industry. The consequences for the measured rate of growth of G.D.P. in total are investigated.

Chapter 7

The purpose of this chapter is to place the rate of growth of New Zealand's G.D.P. in international perspective. This exercise is performed in three stages. The first stage compares the rate of growth of the official index of G.D.P. with the rate of growth of the official G.D.P. indexes of the other countries examined throughout this thesis. The second stage examines the consequences for the measured rate of growth of G.D.P. of measuring output growth in Other Services on a uniform basis in all countries, including New Zealand - this exercise is carried out firstly under the assumption that productivity growth in Other Services is zero, and then under the assumption that the rate is the same as in industry. Under the first assumption, New Zealand's relative position in the international league tables of overall productivity growth improves, and under the second assumption it worsens. Lastly, an attempt is made to allow for the fact that the operation of import controls has lead to an over-valuation of New Zealand's industrial output in relation to the output of the other sectors. Because industry is the fastest-growing major sector, this necessarily somewhat reduces the overall growth rate of measured G.D.P.

New Zealand's rate of growth of G.D.P. in international perspective - Conclusions reached using official indexes

Over the period 1954/55 to 1965/66, New Zealand's official index of constant-price G.D.P. grew by 61.2%, a mean rate of growth of 4.3% per year. Over the same period the number of persons employed[1] grew by 26.9%, from 795,000 to 1,008,700, a mean rate of growth of 2.2% per year.

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(1) That is, the total labour force minus the unemployed but including the armed forces.

This means that, on the basis of official output data, real G.D.P. per person employed grew over the period 1954/55 to 1965/66 at a mean rate of 2.1% per year.

In comparison[1] with other high-per-capita income countries over a similar period of time, New Zealand's rate of growth of G.D.P. was in all respects about average. As Table 7-1 below shows, six countries grew faster, and six grew more slowly. Furthermore, the average of the rates, 4.9% is quite close to the New Zealand value of 4.3%.

Table 7-1 The rate of growth of real G.D.P. over the 1950's and 1960's, 11 countries, calculated from official indexes of real G.D.P.

Country	Period	% per year
Japan	1953-1964	9.2
West Germany	1951-1965	6.4
Italy	1951-1963	5.8
France	1951-1964	5.1
Denmark	1954-1965	5.1
Netherlands	1951-1965	5.0
New Zealand	1954-1965	4.3
Canada	1951-1966	4.7
Austria	1951-1966	4.4
Norway	1951-1965	4.1
Belgium	1951-1964	3.5
United States	1951-1966	3.6
United Kingdom	1951-1965	2.7
Mean		4.9

Source: Calculated from data in "National Accounts of O.E.C.D. countries 1950-1968" (75) for all countries except New Zealand.
New Zealand data taken from 1971 New Zealand Yearbook (67), page 743.

(1) In this comparison, or with all other comparisons of output growth rates in this thesis, rates of growth are calculated between end-years of approximately equal pressure of demand, to minimise the effect that the state of the cycle would otherwise have on the measured rate of growth.

Assessed in terms of growth of real G.D.P. per person engaged, however, New Zealand's performance is not so impressive. As Table 7-2 below shows, New Zealand with its rate of 2.2% per year ranks twelfth, being exceeded by all but one of the countries. Furthermore, the New Zealand rate of 2.2% is a full 1.6 percentage points below the mean.

Table 7-2 The rate of growth of real G.D.P. per head over the 1950's and 1960's, 11 countries, calculated from official indexes of real G.D.P.(1)

Country	Growth rate, % per year
Japan	7.6
France	4.9
West Germany	4.8
Italy	4.2
Austria	4.2
Norway	3.8
Denmark	3.7
Netherlands	3.7
Belgium	3.1
Canada	2.4
United States	2.3
New Zealand	2.2
United Kingdom	2.1
Mean	3.8

(1) G.D.P growth rates taken from Table 7-1 above. Employment growth rates for all countries except New Zealand calculated from data in "Manpower Statistics 1950-1962" (74), and "Labour Force Statistics, (72).
For New Zealand data, see Appendices 1 and 2 to Chapter 7.

Direct comparisons of the rate of growth exhibited by official indexes of real G.D.P. are, however, misleading. It was shown in Chapters 5 and 6 that different countries attributed different, and apparently arbitrary,

rates of productivity growth to many of the activities within the large Service sector. Given that output growth in these activities is equal to actual employment growth plus attributed productivity growth, it follows that a large arbitrary component is built into official indices of real G.D.P. Furthermore, the implicit procedure adopted in New Zealand in the compilation of the official index is, apparently, to assume zero productivity growth in these activities, a procedure which biases New Zealand's measured G.D.P. growth downwards in relation to that of other countries. A standardisation of the method of estimating output growth in these activities where output growth is attributed arbitrarily would therefore eliminate this source of bias, and this is carried out in the next section for all the countries, including New Zealand, for which the appropriate data is available.

The effects on measured G.D.P. growth of standardizing the method of output measurement in Other Services

The process of estimating the rate of growth of G.D.P. using a standardised procedure for estimating the rate of output growth in Other Services is carried out in the following way. The economy is divided into two parts. The first part contains all those activities where output growth is measured by the movement of physical indicators - these are all the industrial activities (New ISIC major divisions 1 to 5), Commerce (ISIC 6), and Transport and Communication (ISIC 7). The methods used in compiling output indices for these activities are reasonably uniform in all the countries being considered and do not need to be changed. The second part of the economy (ISIC 8, 9 and 0) contains all those activities designated as Other Services in this thesis, for which labour productivity growth is obtained by arbitrary attribution, so that the rate of output growth has an arbitrary component in it. Two alternative standardising procedures are applied to this part of the economy. The first takes the base-year value of G.D.P. in Other Services,

and makes it grow at the same rate as Other Service employment; in other words an assumption is made that in all countries, rather than just in some, the rate of labour productivity growth in Other Services is zero. The second,alternative, standardising procedure also starts with base-year G.D.P. in Other Services, but assumes that output grows in this sector at a rate equal to the rate of growth of Other Service employment plus the rate of growth of labour productivity in industry. The reason for investigating the consequences of making this second assumption is that, as was seen in Chapters 5 and 6, productivity growth in those Service activities where productivity can be measured by physical volume indicators does grow more rapidly in countries with rapid industrial productivity growth than in those with slow industrial productivity growth. Explicitly building this tendency into these service activities where output growth cannot be measured by the growth rate of physical indicators therefore represents an interesting alternative procedure.

In order to split an economy into exactly these two parts, it is necessary to have both output data and employment data which can be subdivided in exactly the appropriate manner. Unfortunately such a subdivision is not possible for both series for all the countries of interest over the whole period in question. Nevertheless the two recent O.E.C.D. publications "Labour Force Statistics 1959-1970",(72) and "National Accounts of O.E.C.D. Countries 1960-1970", (76) incorporate the new International Standard Industrial Classification of all economic activities, which makes the precise subdivision that is required possible for a number of countries. The New Zealand data can readily be handled in the same way, for both output[1] and employment data[2] has been presented in this

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(1) The full output data for New Zealand is given in Appendix 1 to this chapter.

(2) The full employment breakdown for New Zealand is given in Appendix Table 2 to this chapter.

thesis according to ISIC subdivisions. Wherever three years of approximately equal pressure of demand could be selected for O.E.C.D. countries, two sub-period growth rates were calculated, so as to obtain as many growth rates as possible from the available data. Thus, for example, two growth rates were calculated for Italy, the first being from 1959 to 1963, and the second from 1963 to 1970.

The results of making each of the two standardizing assumptions can be seen in Table 7-3. For most countries, the effect of making the assumption that productivity growth in Other Services is zero is to reduce the growth rate of measured G.D.P. below the official rate: the reductions, in percentage points are, Belgium 0.5., France 0.4, West Germany 0.9, and 0.3, Italy 1.0 and 0.6, Norway 0.4 and 0.3, United Kingdom 0 and 0.2, a mean reduction for all those countries considered together of 0.5 percentage points. But in the case of Canada and New Zealand the effect is the reverse, being an increase of 0.1 points in the case of New Zealand, and 0.2 for both periods for Canada.

Thus, if it were in fact the case that the rate of productivity growth in Other Services generally is zero, then the arbitrary attribution of a positive rate of productivity growth in this sector by the industrial countries has lead to an upward bias in their rate of growth of measured G.D.P. of no less than 0.6 percentage points on average relative to New Zealand[1]. This bias is a large order of magnitude, representing over one sixth of the average growth rate of these countries[2].

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(1) And 0.7 percentage points relative to Canada.

(2) The average rate of growth of Belgium, France, West Germany, Italy, Norway, and the U.K. was 4.0%.

Table 7-3 The rate of growth of real G.D.P., various countries, under alternative assumption about the rate of productivity growth and output growth in Other Services

Country	Period	Growth Rate of Real G.D.P.		
		From official Sources	Assuming that in Other Services, the rate of output growth = rate of employment growth	Assuming that, in Other Services the rate of output growth = rate of employment growth + the rate of productivity growth in industry
Belgium	1964-70	4.3	3.9	5.2
Canada	1961-66	6.4	6.6	8.2
	1966-69	4.2	4.4	5.4
France	1964-69	5.4	5.0	6.5
West Germany	1962-65	5.1	4.2	5.2
	1965-70	4.5	4.2	5.3
Italy	1959-63	6.1	5.1	7.4
	1963-70	5.1	4.5	6.3
Norway	1960-65	4.8	4.4	5.6
	1965-70	4.4	4.1	5.3
United Kingdom	1960-65	2.9	2.9	3.7
	1965-70	2.2	2.0	3.1
New Zealand	1954-65	4.3	4.4	4.8
		(i)	(ii)	(iii)

Source: For the basic data from which columns (ii) and (iii) were calculated, see Appendix 1 to this chapter, where the method and the data is described in detail. Column (i) was calculated from data in "National Accounts of O.E.C.D. countries, 1960-1970" (76)

It could be, however, that the correct assumption to make about the true rate of productivity growth in Other Services is that the rate is the same as in industry. The consequences of assuming this to be the case can be seen in column (iii) of Table 7-3. The general effect of making this assumption is to increase the rate of growth of measured G.D.P. relative to the official rate, although in some countries, notably Germany in the second period, the increase is small. The increases, in percentage points, are Belgium 0.9, France 1.1, West Germany 0.1 and 0.8, Italy 1.3 and 1.2, Norway 0.8 and 0.9, United Kingdom 0.8 and 0.9, a mean increase of 0.9 percentage points. The increases for Canada are 1.8 and 1.2, and for New Zealand 0.5 percentage points.

Thus, if it were the case that the rate of productivity growth in Other Services equals the rate of growth of productivity in industry, then the effect of the arbitrary allocation of productivity growth in Other Services would be to bias the measured rate of growth of industrial countries downwards by an average of 0.4 percentage points, relative to New Zealand[1]. The reason for this is that, as was seen in Chapter 3, the rate of growth of industrial productivity in New Zealand was relatively low, so that in turn the productivity growth attributed under this assumption to Other Services is relatively low, resulting in a relatively small upward adjustment to measured G.D.P. growth.

The effect of making different assumptions about the rate of growth of productivity in Other Services therefore crucially affects New Zealand's relative performance in the league table of international growth rates of G.D.P. To the extent that it is really the case that

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(1) On either assumption, however, Canada's official index bases its growth rate downwards relative to other countries. This may be because the Canadian measurement procedure is to deflate the wage and salary bill by an index of wage rates. If there is a large increase in the number of lowly-paid workers, as has been the case in Canada with the recent rapid growth in Provincial Government employment, the index so obtained can grow less fast than on index of employment, implying negative productivity growth, even if the productivity of each employee individually has been increasing.

Service productivity grows at the same rate as in industry, New Zealand's official index overstates New Zealand's growth rate to that of other countries. To the extent, however, that the true picture is that productivity growth in all services is zero, New Zealand's official index understates New Zealand's true position. Almost certainly the two assumptions that have been investigated here are polar cases, with the true situation lying somewhere in between. It was argued in Chapter 6 that in all probability, most of the activities carried out under the heading 'Other Services' are of the sort where productivity growth is zero or very close to it. To the extent that this is the case, it is apparent that the rate of growth of real G.D.P., and hence of real G.D.P. per head, calculated from official indexes, understate by perhaps a considerable amount the rate of New Zealand's growth relative to that of other countries. Furthermore, in New Zealand as in other countries, employment is growing more rapidly in Other Services than in the rest of the economy (2.8% per annum, compared with 2.0%), so that the magnitude of such a correction will, in the future, be even greater.

The effect on the measured growth rate of the over-valuation of industrial output

The purpose of this section is to place an order of magnitude on the effect that over-valuation of the output of New Zealand industry relative to the output of the other sectors, caused by the operation of quantitative import restrictions and discussed in Chapter 1, could have had on the measured growth rate of the G.D.P. This is a purely mechanical exercise, merely making the reduction of the value of the G.D.P. originating within industry by the estimated amount of the overcalculation. Given that industry was the most rapidly-growing large sector, it follows that such a correction will lower the measured

rate of growth of thw G.D.P.

It must be emphasised that this is purely a measurement question - the concern here is not with whether quantitative restriction actually raised or lowered the rate of growth from what it would otherwise have been, but is merely with whether the growth that actually took place has been correctly measured.

To obtain an idea of the order of magnitude involved, it is appropriate to consider what are likely to be extreme values, and apply these figures as a test of the sensitivity of the measured rate of growth of the G.D.P. to these assumptions. It would seem unlikely that the degree of overvaluation of the finished product was, on average, less than 10%, and improbable that it was greater than 50%. Given that the value added content of New Zealand industry averaged about 40%(1), it follows that the magnitude of the overvaluation of the G.D.P. originating within the industrial sector was something between 25% and 125%.(2)

On the basis of these two assumptions, the following alterations could be made to measured G.D.P. The value of G.D.P. originating in the industrial sector in 1954/55 is reduced from $m 405(3) to $m 324 (on the 25% assumption) or to $m 180 (on the 125% assumption). The value of industrial G.D.P. in 1965/66 is likewise reduced from $m 810(3) to $m 648 or $m 360. Hence G.D.P. in 1954/55(3) is reduced from $m 1877 to $m 1796 or $m 1652, and in 1965/66 to $m 2877 or $m 2598. The resulting rates of growth of G.D.P. would be 4.3% on the 25% assumption,

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(1) In 1962/63, for example, value added by industry was $m 337.7 and the value of gross output was $m 840.6. See "Factory Production Statistics, 1962-63". (60).

(2) $10\% \times \frac{100}{40}$ and $50\% \times \frac{100}{40}$ respectively.

(3) These values are taken from the full set of sectoral accounts, constructed in this thesis, and presented as Appendix 3 to this chapter.

and 4.1% on the 125% assumption, respectively 0.1 and 0.4 percentage points below the 4.4% rate given in Appendix 1. The correction is therefore not particularly large, particularly when it is recognised that the 125% assumption is a very pessimistic estimate of the true extent of overvaluation.

It has been shown so far in this chapter that the two corrections that need to be made to the published National Accounts data have opposite signs. The first correction, for the inappropriate attribution of labour productivity growth in Other Services has a positive sign. The second correction, for the error introduced by the over-valuation of the output of the manufacturing sector, has a negative sign. The purpose of the concluding section of this chapter, therefore, is to select the most plausible magnitude for each of the two corrections, and hence to establish the growth rate of real G.D.P. that is most likely to be correct.

The net effect of the corrections to the measured rate of growth of G.D.P.

It was shown in the first part of this chapter that if it is true in fact that the rate of productivity growth in Other Services is zero, then the New Zealand procedure of implicitly attributing slightly negative productivity growth produces a slightly downward-biased estimate, whereas the procedure adopted by the other countries of attributing substantial labour productivity growth in Other Services pictures a considerably upward-biased estimate. In such a circumstance the official growth rate of the other countries is biased upwards by an average of 0.5 percentage points relative to the correct value, and the New Zealand rate is biased downwards by 0.1 percentage points relative to the correct value.

If, however, it is true in fact that labour productivity grows in Other Services at the same rate as in industry, then the official estimate of the New Zealand rate is biased downward by 0.5 percentage points and that of the other countries is biased downwards by, on average, 0.9 percentage points.

It is difficult to be certain which of these two polar cases more nearly represents the true position. It is probably best to be guided in this matter by the U.K. experience, because as was shown in the last chapter, that country more than any other has made strenuous efforts to derive physical indicators to represent the growth of real output in Other Services. The estimated rate of growth of labour productivity in Other Services in the U.K. was 0.1 per cent per year between 1960 and 1965, and 0.6 per cent per year between 1965 and 1969(1). Both these rates are substantially less than 1 per cent per year, so that it would seem that, in the absence of any strong evidence to the contrary, it would be inappropriate to attribute a rate of productivity growth in excess of 0.5 per cent per year to Other Services in New Zealand or in any other country.

As far as the correction for the overvaluation of manufacturing output is concerned, the sensitivity test carried out in the previous section showed that the magnitude of the correction to be applied will be fairly small. The only detailed estimate of the extent of the overvaluation of New Zealand manufacturing output has been performed by Elkan (18), for the periods 1955-1958 and 1964-1967. These estimates show an average overall over-estimate of approximately 60%(2).

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(1) See Appendix to Table 7-1 this Chapter.

(2) 50.0% for the first period, and 73.4% for the second - see Elkan, op. cit. Table 12, page 70.

Given that, as was seen in the earlier part of this chapter, a 25% overvaluation leads to a 0.1% over-estimation of the growth rate, and that a 125% overvaluation leads to a 0.4% over-estimation, it follows that a 60% overvaluation causes the overall growth rate of G.D.P. to be biased upwards by 0.2 percentage points per year.

The net effect of the correction for these two biases, one upwards and the other downwards, is to leave the initial estimate made in the previous chapter virtually unchanged. It can therefore be stated as a formal conclusion that, on the best evidence available, the true rate of growth of G.D.P. in New Zealand over the period 1954-55 to 1965-66 was equal to or possibly slightly greater than the 4.4% rate given in Appendix Table 7-2 to this chapter. This rate is 0.1 percentage points higher than the official rate of 4.3% per year.

It having been accepted that the true rate of growth of labour productivity in Other Services is likely to be low, it also follows that growth rates of G.D.P. for the other high-per-capita-income countries are significantly upward-biased, by an average of 0.6 percentage points. New Zealand's productivity performance, therefore, is considerably better in international comparison than a study of official indexes of real G.D.P. would suggest.

Appendix Table I to Chapter 7.

Calculation of the rate of G.D.P. growth, various countries, under different assumptions.

Throughout this Appendix, upper case letters indicate the absolute value of a variable, lower case letters indicate the rate of growth of the variable. All employment data is taken from the O.E.C.D. publication "Labour Force Statistics 1960-1970" (72). The value of G.D.P. originating within sectors ISIC 1 to 7 (Industry, Agriculture, Transport and Communication, and Commerce) is taken directly from the O.E.C.D. publication "National Accounts of O.E.C.D. countries 1960-1970" and the values are expressed in domestic currency. The value of G.D.P. originating in sectors ISIC 8, 9 and 0 (Other Services) designated as $G.D.P._1$ is also taken from the O.E.C.D. national accounts publication. The alternative values for G.D.P. originating within the Other Services sector are obtained as follows. $G.D.P._2$ assumes the base-year value from the official publication, and thereafter grows at the same rate as employment in that sector, i.e., e for ISIC 8, 9, 0. $G.D.P._3$ also assumes the base-year value from the official publication, but thereafter grows at the rate of growth of employment in that sector, i.e., e for ISIC 8.9.0 plus the rate of growth of productivity in the rest of the economy, i.e., e + p ISIC 1-7. Corresponding to these three values for G.D.P. originating within Other Services there are three values for total G.D.P. (rows 17-19), and three values for the rate of growth of total G.D.P. (rows 20-22).

New Zealand

	1954/55	1965/66
ISIC groups 1-7		
GDP	1645	2743
E	638.14	794.67
e		2.0
gdp		4.7
p=gdp-e		2.7
ISIC groups 8,9,0		
GDP_1	232	(Not available from official sources)
E	156.86	214.03
e		2.8
GDP_2	232	316
GDP_3	232	425
gdp_1		
gdp_2		2.8
gdp_3		5.5
adjustments	-	-
residual error	-	-
ISIC groups 1 - 0 (Total)		
GDP_1	1877	3026
GDP_2	1877	3059
GDP_3	1877	3168
gdp_1		4.3
gdp_2		4.4
gdp_3		4.8

Canada

	1961	1966	1969
ISIC groups 1-7			
GDP	23805	33915	38222
E	4281	4810	5038
e		2.33	1.54
gdp		7.08	3.99
p=gdp-e		4.75	2.45
ISIC groups 8,9,0			
GDP_1	12244	15784	18174
E	1773	2343	2742
e		5.58	5.24
GDP_2	12244	16184	18939
GDP_3	12244	20523	25848
gdp_1		5.08	4.70
gdp_2		5.58	5.24
gdp_3		10.33	7.69
adjustments	-	-	-
residual error	-13	-	-
ISIC 1-0 (Total)			
GDP_1	36049	49699	56396
GDP_2	36049	50099	57161
GDP_3	36049	54438	64070
gdp_1		6.42	4.21
gdp_2		6.58	4.40
gdp_3		8.24	5.43

ITALY

	1959	1963	1970
ISIC groups 1-7			
GDP	15030	19776	28802
E	17232	16635	15589
C		-0.88	-0.93
gdp		6.86	5.37
p=gdp-e		7.74	6.30
ISIC groups 8,9,0			
GDP_1	6699	7903	10689
E	2755	2840	3185
e		0.76	1.64
GDP_2	6699	6906	7746
GDP_3	6699	9412	16408
gdp_1		4.13	4.31
gdp_2		0.76	1.64
gdp_3		8.50	7.94
Adjustments	-	-	-
Residual Errors	-	-	-
ISIC Groups 1-0 (Total)			
GDP_1	21729	27679	39491
GDP_2	21729	26682	36548
GDP_3	21729	29188	45210
gdp_1		6.05	5.08
gdp_2		5.13	4.49
gdp_3		7.38	6.25

Norway

	1960	1965	1970
ISIC Groups 1-7			
GDP	25217	32220	39719
E	1151	1153	1157
e		0.03	0.07
gdp		4.90	4.18
p=gdp-e		4.87	4.11
ISIC Groups 8,9,0			
GDP_1	7453	9235	11843
GDP_2	7453	8547	10310
GDP_3	7453	10904	16513
gdp_1		4.29	4.97
gdp_2		2.74	3.75
gdp_3		7.61	7.86
Adjustments	-	-	-
Residual Error	-	-	-
ISIC Groups 1-0 (Total)			
GDP_1	32670	41455	51562
GDP_2	32670	40767	50029
GDP_3	32670	43124	56232
gdp_1		4.76	4.36
gdp_2		4.43	4.09
gdp_3		5.55	5.31

United Kingdom

	1960	1965	1969
ISIC groups 1-7			
GDP	17781	20765	22612
E	17897	18176	17272
e		0.31	-1.28
gdp		3.10	2.13
p=gdp-e		2.79	3.41
ISIC groups 8,9,0			
GDP_1	7574	8544	9350
E	6360	7151	7632
e		2.34	1.63
GDP_2	7574	8514	9088
GDP_3	7574	9789	11975
gdp_1		2.41	2.25
gdp_2		2.34	1.63
gdp_3		5.13	5.04
Adjustments	-	-	-
Residual Error	-256	-250	-40
ISIC groups 1-0 (Total)			
GDP_1	25355	29309	31962
GDP_2	25355	29279	31700
GDP_3	25355	30554	34587
gdp_1		2.90	2.17
gdp_2		2.88	1.99
gdp_3		3.73	3.10

West Germany

	1962	1965	1970
ISIC groups 1-7			
GDP	296.66	342.68	434.00
E	21738	21793	21301
e		0.08	-0.46
gdp		4.81	4.72
p=gdp-e		4.73	5.18
ISIC groups 8,9,0			
GDP_1	75.35	91.28	109.33
E	4644	4906	5404
GDP_2	75.35	79.60	87.66
GDP_3	75.35	91.74	130.90
gdp_1		6.39	3.61
gdp_2		1.83	1.93
gdp_3		6.56	7.11
Adjustments	-	-	-
Residual Error	-	-	-
ISIC groups 1-0 (Total)			
GDP_1	372.01	433.96	543.33
GDP_2	372.01	422.28	521.66
GDP_3	372.01	434.42	564.90
gdp_1		5.13	4.50
gdp_2		4.22	4.23
gdp_3		5.17	5.27

Belgium

	1964	1970
ISIC groups 1-7		
GDP	453.3	588.4
E	2799	2797
e		-0.01
gdp		4.35
p=gdp-e		4.36
ISIC groups 8,9,0		
GDP_1	201.8	256.9
E	810	950
e		2.66
GDP_2	201.8	236.7
GDP_3	201.8	307.1
gdp_1		4.02
gdp_2		2.66
gdp_3		7.00
Adjustments	-	-
Residual Error	-	-
ISIC group 1-0 (Total)		
GDP_1	655.1	845.3
GDP_2	655.1	825.1
GDP_3	655.1	985.5
gdp_1		4.25
gdp_2		3.85
gdp_3		5.21

France

	1964	1969
ISIC groups 1-7		
GDP	320.91	421.40
E	15236	15088
e		-0.20
gdp		5.45
p=gdp-e		5.65
ISIC groups 8,9,0		
GDP_1	117.54	152.83
E	4186	5005
e		3.57
GDP_2	117.54	140.51
GDP_3	117.54	186.38
gdp_1		5.25
gdp_2		3.57
gdp_3		9.22
Adjustments	-	-
Residual Error	-	-
ISIC groups 1-0 (Total)		
GDP_1	438.45	574.23
GDP_2	438.45	561.91
GDP_3	438.45	607.78
gdp_1		5.40
gdp_2		4.96
gdp_3		6.53

Appendix Table 2 to Chapter 7

Industrial Distribution of the Labour Force, New Zealand 1954/55 and 1965/66. Original source of data : New Zealand Department of Statistics Publication "Prices, Wages and Labour" (68). Converted to a production year basis by Gillion and Frankel (23)

	Number engaged, thousands 1954/55	1965/66	Growth Rate, % per year
Farming	129.95	124.40	-0.4
Forestry	2.57	3.22	2.1
Fishing	5.23	6.45	1.9
Mining	7.30	6.68	-0.8
Construction	77.12	94.10	1.8
Public Utilities	9.85	13.30	2.7
Manufacturing	189.46	267.95	3.1
Transport	60.74	71.82	1.5
Communication	19.19	26.90	3.1
Wholesale and Retail Trade	116.55	150.26	2.3
Banking and Finance	20.18	29.59	3.5
Other Services	156.86	214.03	2.8
Total	795.00	1008.70	2.2

Appendix Table 7-3

Complete 12-sector national accounts of G.D.P. by sector of origin, New Zealand, constant 1954/55 prices

Sector New ISIC Division	Value of G.D.P. originating, constant 1954/55 prices, $m 1954/55	1965/66	Rate of growth, % per year
Farming	388	580	3.7
Forestry	15	23	3.9
Fishing	6	8	2.6
Mining	19	29	4.0
Construction	154	241	4.1
Public Utilities	30	73	8.1
Manufacturing	405	810	6.3
Communication	32	57	5.2
Transport	162	262	4.4
Wholesale & Retail Trade	380	581	3.9
Banking and Finance	54	79	3.5
Other Services	232	316	2.8
G.D.P.*	1877	3059	4.5

Source: See notes to Appendix Table 1 to Chapter 7.

* Note that this definition of G.D.P. corresponds to $G.D.P._2$ presented in Appendix Table 1 to Chapter 7.

Appendix Table 7-4 Sources of Data and the calculation of growth rates.

Virtually all the data examined in this thesis has been obtained from official sources. The most commonly-used sources of the New Zealand data were various publications by the Government Statistician and by the Department of Labour. Data for the O.E.C.D. countries invariably came from official O.E.C.D. sources. The only data not to have come directly from official sources was that obtained from Gillion and Frankel (23) for the study of output and employment in the services sector, and much of this data was provided indirectly by official sources. In all cases the precise source of data examined in this thesis is cited at the foot of the relevant table.

Of the many different methods by which rates of growth may be calculated, two are frequently used in empirical economic analysis. The first is simply to calculate a compound rate of growth between end-period values. The second method is to fit a logarithmic trend to all the observations by ordinary least squares. Although the second method has the advantage of reducing the effect of unrepresentative conjunctural observations, in practice greater differences in the calculated growth rates result from changing the end-years than from changes in the method of computation.

Accordingly, in view of the large number of growth rates that had to be calculated, it was decided generally to use the simpler method of calculating the rate between end-year values, and to exercise extreme care in the choice of end-years. Time series of output and employment were plotted, peaks were identified, and then unemployment data was examined to check that the "peak" values represented years of approximately equal pressure of demand, as represented by the state of the labour market. These "peak" years were then selected as end years, and a "peak-to peak" growth rate was calculated.

Throughout this thesis continuously-compounding, rather than annually-compounding, rates of growth were calculated, so that the rate of growth of labour productivity could be obtained by identity as the difference between the rate of growth of output and the rate of growth of employment.

The only occasion on which the ordinary-least-squares method of trend calculation was used was in the calculation of growth rates of output at the 2-digit level for manufacturing activities in Chapter 3. The ordinary-least-squares method was used there because the end-years were dictated by the availability of data, so that it was derived to minimise as much as possible any chance effects of unrepresentative end-years.

Conclusions

The conclusions of this thesis are as follows.

Chapter 1

New Zealand is a country with a high standard of living. According to official statistics of G.D.P. per capita, real income per head has grown more slowly in New Zealand than in most other rich countries, although a consideration of various indicators of social welfare suggests that the relative decline in New Zealand's position has not been unduly severe. Over the post-war period the growth of the economy, which has a relatively large agricultural sector, has been smooth in comparison with the experience of many countries. This has been due at least in part to the operation of the quantitative import restriction system, which has made it possible to divert expenditure away from imports and towards home-produced goods whenever the balance of trade situation deteriorated. In this way a continuously low level of unemployment was achieved, and this was accompanied by a relatively low rate of growth of prices. The quantitative import restriction system has, however, frequently been blamed for New Zealand's relatively low measured rate of growth of output per head, the most frequent argument being the controls have distorted relative prices and led to a misallocation of resources, particularly investment.

Chapter 2

A consideration of the theory of protection shows that import controls can be expected to operate on the growth rate in a number of ways, some of which will exert a positive influence on the growth rate, and some of which will exert a negative influence. It is therefore extremely difficult to generate an a priori expectation of what the net effect of import controls would be. Although there is published evidence to show that import controls have affected certain industries, it is not clear what the overall effect of these restrictions has been on the economy as a whole. Accordingly a sector-by-sector study is carried out in this thesis to establish how the growth of output and labour productivity compares with the performance of other countries.

Chapter 3

The rate of growth of industrial output has been high in international comparison, the New Zealand rate being exceeded only by Japan, West Germany, Italy, and Australia. The rate of growth of labour productivity in industry has, however, been relatively low, due in part to a relatively low level of industrial investment. When appropriate allowance is made for the low level of investment, it appears that the rate of growth of output per man has still been a little below what might have been expected from international experience. Whether this can be blamed specifically on import controls is however, arguable, because Canada too fared a little worse than would have been expected on the basis of general international experience, and that country protected by means of a tariff. It is possible that New Zealand's slightly below-par performance could be attributed to the general effects of protection, although it is shown that Australia, which protected its manufacturing sector by means of a tariff, performed well in international comparison. As far as industry is concerned, therefore, there is no evidence that import controls had a strong adverse effect on the rate of growth of output and productivity. There is, however, evidence to suggest that protection did influence the structure of industrial development, because the profile of industrial development in New Zealand at the 2-digit level looked similar to that of Australia, South Africa, and Canada, and quite unlike that of Norway and Denmark, which dismantled their protective system early in the post-war period. In the other industrial activities, the rate of growth of productivity in New Zealand was at or above the international average.

Chapter 4

Output in Agriculture grew more rapidly in New Zealand than in any other rich country except Japan, but output per man grew relatively slowly in New Zealand. Whereas in many European countries productivity growth is in large part a matter of increasing farm size through amalgamation, as well as improving techniques of production within the confines of existing technology, in New Zealand, where the level of output per man is higher than anywhere else in the world, new techniques have to be discovered and implemented if output per man is to increase substantially.

The adoption of such new cost-saving techniques has to a certain extent been forced on Agriculture in New Zealand, because world prices for its products have been increasing less rapidly than the prices of purchased inputs, many of which are produced by the protected industrial sector. Thus to some extent at least import controls have imposed a continuous cost-squeeze on Agriculture, with the result that productivity possibly grew faster than would have been the case had industry not been protected.

Chapter 5

In New Zealand, unlike most developed countries, information on output growth in the various service activities of the economy is very limited. Only one official index of output is provided, for the services sector as a whole. This sector produces nearly half of total G.D.P., so this data situation is highly unsatisfactory. To overcome this lack of information, separate output indexes were derived in this thesis for Transport, Communication, and Wholesale and Retail Trade, using similar indicators to those customarily used in O.E.C.D. countries. Output indexes for Banking Insurance and Real Estate, Public Administration and Defense, Health and Education Services, and Miscellaneious Services were derived under an initial assumption that in those activities the rate of growth of output was equal to the rate of growth of employment. The resulting index for the Services sector as a whole exhibited a slightly higher rate of growth than the official index. In comparison with the procedures adopted by O.E.C.D. countries, therefore the procedure adopted in the compilation of the Offical index underestimates the rate of growth of Service sector output.

Chapter 6

The rate of growth of labour productivity in Wholesale and Retail Trade in New Zealand was rather low in international comparison, but exhibited the same relationship to the rate of growth of industrial productivity as was characteristic of all the other industrial countries. The growth of productivity in Transport and Communication was also in line with the rate of growth of productivity in industry, so that these parts of the Services sector conformed to the general pattern of behaviour exhibited by other countries. It is not, however, appropriate

to compare the rate of growth of productivity in the other parts of the Service sector in New Zealand with the performance of other countries, which attribute positive productivity growth to those sectors where no physical indicator of output growth is available.

Chapter 7

The rate of productivity growth attributed to the various activities for which no physical indicator of output is available is high in a number of O.E.C.D. countries. The only country to have made a thorough attempt to examine physical indicators, the United Kingdom, finds that the rate of growth of productivity in many service activities is rather low, characteristically being less than 1% per year. An adjustment of the constant-price national accounts of various O.E.C.D. countries to take account of the fact that the majority of these countries attribute too high a rate of productivity growth in these various service activities indicates that in international comparison the rate of growth of output per person employed in New Zealand has been relatively much more creditable than a comparison of official data would suggest. While it is still true that the rate of growth of output per man has been lower in New Zealand than in many other countries, the magnitude of the difference between New Zealand's overall growth rate and the adjusted growth rate of various O.E.C.D. countries is not particularly large, and conveys a similar impression to that given by a consideration of various indicators of social welfare.

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