

AGRICULTURAL
ECONOMICS
RESEARCH UNIT



Lincoln College

PRODUCTIVITY, PLANNING,
AND THE PRICE MECHANISM

IN

NEW ZEALAND MANUFACTURING INDUSTRY

BY

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THE AGRICULTURAL ECONOMICS RESEARCH UNIT

THE Unit was established in 1962 at Lincoln College with an annual grant from the Department of Scientific and Industrial Research. This general grant has been supplemented by grants from the Wool Research Organisation, the Nuffield Foundation and the New Zealand Forest Service for specific research projects.

The Unit has on hand a long-term programme of research in the fields of agricultural marketing and agricultural production, resource economics, and the relationship between agriculture and the general economy. The results of these research studies will be published as Unit reports from time to time as projects are completed. In addition, it is intended to produce other bulletins which may range from discussion papers outlining proposed studies to reprints of papers published or delivered elsewhere. All publications will be available to the public on request.

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PRODUCTIVITY, PLANNING, AND THE PRICE MECHANISM
IN
NEW ZEALAND MANUFACTURING INDUSTRY

Address to Annual Meeting of Canterbury Manufacturers' Association
August 1966

by

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PRODUCTIVITY, PLANNING, AND THE PRICE MECHANISM IN
NEW ZEALAND MANUFACTURING INDUSTRY

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1. INTRODUCTION

I propose to concern myself in this paper with the broad theme of the relative place in the economy of agriculture and manufacturing industry. These two very important sectors of the economy are of course alternative and competing methods of increasing real incomes per head in New Zealand. They are alternative methods because, largely speaking, local manufacturing represents a method of providing goods which could otherwise be provided by imports of finished goods, paid for by agricultural exports. They are competing methods because clearly the resources used in one sector cannot be used in the other. This is especially important with capital, in particular imported capital goods of which New Zealand is very short.

Our aim is to look to the future - to the next decade - but, as with any intelligent and perceptive look at the future, we must first look at recent history. Accordingly, I propose to deal, firstly, with the contribution of the two industries to New Zealand's growth over the last decade.

I shall then turn to the next decade and adduce the factors which, in my view, determine whether manufacturing growth should be faster or slower than it has in the past.

Finally I would like to make some comments as to the methods I consider ought to be used to get the sort of expansion we want, including the role of economic planning for the manufacturing industry.

Many of the facts and figures I will be quoting come from the research programme of the Agricultural Economics Research Unit at Lincoln College which, amongst other things, is concerned with economic research on the place of agriculture in the economy, in the investigation of which it is of course necessary to carry out a number of measurements relating to manufacturing.

SECTORAL CHANGES IN PRODUCTIVITY AND CONTRIBUTION TO NATIONAL PRODUCT

Lincoln College

1954/55 to 1964/65

Agricultural Economics Paper No. 393

<u>Sector</u>	<u>Gross Domestic Product</u> <u>in 1964/65 Prices</u>			<u>Labour Force</u>	<u>Productivity</u>	<u>Change in Total Product</u> <u>Due to</u>	
	<u>1954/55</u>	<u>1964/65</u>	<u>Annual</u> <u>Percentage</u> <u>Rate of Change</u>	<u>Annual</u> <u>Percentage</u> <u>Change</u>	<u>Annual</u> <u>Percentage</u> <u>Change</u>	<u>Increased</u> <u>Labour Force</u>	<u>Increased</u> <u>Productivity</u>
	<u>£mn</u>		<u>%</u>	<u>%</u>	<u>%</u>	<u>£mn</u>	<u>1964/65 prices</u>
<u>Primary Sector</u>							
Farming	236	333	3.5	-0.9	4.5	-20	117
Forestry	9)	12)))))
Hunting & Fishing	4)	5)	3.3) 0.1) 3.2) 1) 8
Mining	11)	15)	—) —) —) —) —
<u>Total Primary</u>	<u>260</u>	<u>365</u>	<u>3.5</u>	<u>-0.8</u>	<u>4.3</u>	<u>-19</u>	<u>125</u>
<u>Secondary Sector</u>							
Manufacturing	246	432	5.8	3.0	2.7	84	102
Public Utilities	21	45	8.1	1.9	6.1	4	20
Bldg. & Constr.	80	124	4.4	1.9	2.5	16	28
<u>Total Secondary</u>	<u>347</u>	<u>601</u>	<u>5.6</u>	<u>2.7</u>	<u>2.9</u>	<u>104</u>	<u>150</u>
<u>Tertiary Sector</u>							
Transport & Commun.	100	138	3.2	2.0	1.2	22	15
Other Services	398	566	3.6	3.0	0.6	135	33
<u>Total Tertiary</u>	<u>498</u>	<u>704</u>	<u>3.5</u>	<u>2.8</u>	<u>0.7</u>	<u>157</u>	<u>48</u>
<u>Total Economy</u>	<u>1105</u>	<u>1670</u>	<u>4.2</u>	<u>2.1</u>	<u>2.1</u>	<u>242</u>	<u>323</u>
<u>Gross Domestic Product</u>							

For Sources See Appendix

2. THE LAST DECADE - THE GROWTH OF AGRICULTURE AND MANUFACTURING

The attached table gives the results of some of our research into the ingredients of growth in total output and in output per head of labour force in New Zealand over the last decade, according to the main industrial groups into which the economy can be divided, but grouped broadly into primary, secondary and tertiary sectors. Some notes on the table now follow.

- (i) The first main column gives the contribution of each industry to New Zealand's gross domestic product (at factor cost). The gross domestic product of each sector is calculated from the total value of production less payments to other industries and for imports. The remainder thus represents the payments to factors of production employed including profits, and being gross it also includes depreciation.
- (ii) The gross domestic product figures are given for the beginning and the end of the decade 1955-65 and they are expressed in terms of 1964-65 prices so that our measurements are in real rather than money terms. The individual amounts for each industry thus represent the contribution of each industry and sector to real gross domestic product in 1954/55 and 1964/65.
- (iii) Alongside are given the compound annual percentage rates of growth of these sector contributions.
- (iv) Manufacturing industry's growth rate in real product (5.8% p.a.) has been second only to the 8.1% p.a. registered by public utilities, which is made up largely

of electricity production.

- (v) Matters are somewhat different however when we take account of the labour force employed (the annual growth rate in which is shown in the next column) and which, when divided into the growth rate in product, give us the growth rate in labour productivity as shown in the next column.
- (vi) Public Utilities scored the highest rate of increase in product per unit of labour with agriculture a good second at 4.5% p.a. The productivity growth rate in manufacturing was 2.7% p.a. The lowest rate, confirming common experience in other countries, was 0.6% p.a. in services - retailing professional services, banking, finance, etc.
- (vii) These individual sector productivity growth rates, when averaged out, give the national productivity growth rate of 2.1% p.a.
- (viii) The next two columns give the same figures in money terms (again measured in 1964/65 prices). The change in the product of each sector and of the economy is divided into that part attributable to the increased labour force (what we might call the "scale" effect) and that due to greater product per head. Thus, of the £97 million extra product from agriculture, £117 million came from increased productivity and -£20 million, i.e. a reduction from the fall in the labour force. In manufacturing, £102 million came from increased productivity and £84 million from the increased labour force, totalling £186 million total change.

- (ix) The 2.1% p.a. increase, over the decade, in national productivity represents the potential increases available in per head living standards or real income - I say potential, because from this increase in gross domestic product, has to be paid interest on overseas debt and other remissions of income to overseas; and as well, an allowance has to be made for changes in the terms of trade which, over part of this period at any rate, were declining. The effect of these two factors was to provide a rate of growth in real income per head somewhat lower than the 2.1% growth in product per head and it is, of course, this low growth rate in real income per head about which there has been such concern in recent years.
- (x) While detailed measurements are not as yet available, there is some evidence that the productivity growth rate by both agriculture and manufacturing was much faster in the second half of the decade than in the first and in addition, with recent revivals in the agricultural terms of trade, real income growth rates have also improved.

3. THE DETERMINANTS OF PRODUCTIVITY GROWTH

It is natural to ask what were the factors bringing about these different rates of productivity increase. There are at work two main factors, viz, increased use of capital per head and increased efficiency. The former of course implies use of more resources, the latter is the result of a more effective use of existing resources and covers such things as technical change, new management methods and greater efficiency, economies of scale etc.

An approximate measure of the relative effect of these two factors is as follows:

	<u>Annual Percentage Change in Productivity</u>		
	<u>due to:</u>		
	<u>More Capital</u>	<u>Greater Efficiency</u>	<u>Total</u>
Agriculture	2.1	2.4	4.5
Manufacturing	1.2	1.5	2.7
Total Economy	1.1	0.8	2.1

Not only was agriculture's productivity rate much higher than in manufacturing, but the proportion of it attributable to efficiency is also much higher. In money terms we can value this increased efficiency as being worth about £50 million in 1964/65 prices over the whole decade. This increase in efficiency we can attribute largely to the discovery of new ideas and production methods by agricultural research, in state research institutions including the Agricultural Colleges, and the promulgation of these new ideas amongst farmers by extension services. I would say that this represents a very good return indeed on the money

spent in this way.

In parenthesis we might note that the national increase in efficiency of 0.8% p.a. is far lower than that achieved pre-war in New Zealand - around 2.2% p.a. None of us would identify pre-war New Zealand as a period of dynamic expansion and yet in this period we achieved a faster growth rate in real product per man, little of it due to increased capital but mostly to increased efficiency.

Though it is difficult to substantiate the view, I would suggest that the reasons for this decline in efficiency lie in

- (i) The cosier and less competitive post-war business climate, due to import controls and continuous inflation, has possibly reduced managerial efficiency.
- (ii) Similar effects on labour efficiency have probably resulted from post-war, over-full employment.
- (iii) There has been post-war a far greater tendency towards rapid obsolescence of equipment and the urge to judge re-equipment on technical rather than economic grounds whereas, pre-war, industrial capital equipment was probably used much more intensively with shift work, etc.
- (iv) Lastly, there has been the decline, compared with pre-war, in the relative size of the high productivity sector, viz, agriculture, and of course this has reduced the national average productivity growth rate.

So much for history however; let us look now at the future of manufacturing in New Zealand over the decade ahead of us but always bearing in mind what we have learned from our incursion into recent history.

4. THE DECADE AHEAD

In looking to the future, I take it as our aim to secure the highest possible rate of growth in real income per head. Given the very rapid rate of increase in productivity in agriculture (especially in the last five years when, significantly enough, the national growth rate has also increased), and the fact that it is so much higher than in manufacturing, it is natural to ask why shouldn't there be even more accent on agriculture in future, even if at the expense of a slower growth rate in manufacturing total product, though not necessarily of course in productivity.

To assess this view, or indeed any other view, about the future relative importance of agriculture and manufacturing industry, we need to take account of some further questions which are as follows:

- (a) The capital requirements per unit of product in manufacturing and agriculture respectively, and the possibility of diminishing returns in agriculture;
- (b) The contribution to export earning and true import substitution of either industry;
- (c) The prospects for marketing exports and the terms of trade and the possibility of diminishing returns in marketing agricultural products;
- (d) The provision of employment.

These, I suggest, are the four matters which not only must be taken into account in suggesting that agriculture

should expand more rapidly, but also they should be used as the touchstones against which we should judge the particular types of manufacturing expansion that we should want to see over the next decade.

I can, in the time available, only deal briefly with each.

5. CAPITAL REQUIREMENTS

Capital is a scarce resource and our view as to the desirable rates of relative expansion in agriculture or manufacturing should depend in part on the capital required to secure a given increase in real product - in particular we would want to be assured that, as a result of diminishing returns, capital requirements in agriculture were not rising too fast.

Capital requirements in agriculture are quite high. We estimate⁽¹⁾ that in the last decade, gross investment in agriculture amounted to £345 million at 1964/65 prices. Against this there are some important offsetting factors, including firstly the fact that much of this investment was in pasture improvement and requires no allowance for depreciation or replacement - indeed with good stocking practices much of it will appreciate in value. Furthermore, the

(1) See forthcoming AERU paper "Productivity and Technical Progress in New Zealand Agriculture". The figure given excludes investment in rural houses and is confined therefore to productive investment only.

import content of this investment is quite low (in 1954/55 gross investment in farming had an import content of only about 10%).

As far as diminishing returns is concerned, this seems so far to have been well offset by the very high rate of increase in efficiency in agriculture, of which I spoke earlier.

In the manufacturing industry, capital requirements per unit of output have been rather lower. Total gross investment over the last decade we estimate ⁽¹⁾ at £387 million in 1964/65 prices. At the present time gross investment in manufacturing is running around £40 million per annum. The import content of this manufacturing investment is of course very high (around 55 per cent). This high and growing demand for industrial equipment was, as it happens, a major contributing factor to the balance of payments crisis which we currently face. We would be wise to also take account of a fair amount of other investment such as in hydro electricity, some of which can be directly attributed to manufacturing growth. Considerations of this nature can only be allowed for by using a full interindustry model, a matter to which we will return later.

In the light of these facts, I believe that the type of capital saving trends we should want to see in manufacturing industry are those which raise the "efficiency" rate which

(1) The methods used in formulating this estimate will be published in a forthcoming AERU publication reporting on the results of a project estimating real capital in major sectors in New Zealand.

I have already defined, and which we have seen is so much lower in manufacturing than in agriculture. The developments which will raise the "efficiency" rate are:

- (i) Increased concentration on a narrower range of products to reap the largest possible economies of scale.
- (ii) Greater competition with imports through the abolition of import control on competing products.
- (iii) Increased accent on industrial research and extension as in agriculture. Here however I must express concern lest we spread too thinly, over too wide a field, our limited research resources, which, as I have shown you, have paid off so well by being concentrated in primary industry in general.

6. EXPORT EARNING AND IMPORT SAVING

In the future, as in the past, there will be a severe restraint on our rate of economic growth springing from the perennial shortage of foreign exchange. This places an added premium (which would be evident if we had a free exchange rate) on industries which can earn or save foreign exchange.

The case for agriculture in this respect does not need elaboration by me.

As far as manufacturing is concerned, its role in the past has been largely thought of as an import saver. In many cases I believe the contribution made in this regard has been

vastly overstated, largely because indirect imports (such as imported capital equipment and its replacement referred to before) have been ignored, or because no account appears to have been taken, as with the steel industry, of the enormous draughts on other national resources such as electricity which follow from such projects. Nor, so far as I am aware, has any attempt been made to measure the imports saved, in various industries, per £100 of capital required, to compare with the potential exports which could have been earned with those resources if they had been used in export industries.

Be that as it may, import substitution has gone as far as it can, and attention is now turned to the role of the manufacturing industry as an exporter. If we don't look out the same errors will occur.

What sort of industries would we expect to see encouraged as good potential exporters? They will of course be the same as the good import savers, viz, ones that per £100 of capital can earn in foreign exchange, as much or nearly as much as existing successful exporters which, not surprisingly, are the ones which are based on the facts of New Zealand's natural resource endowment - the ones that cash in on the cheapest resources we have got. Our cheapest resources, in fact they are free, are firstly land and a good climate, on which are based our cheap agricultural and forestry exports. Secondly, our scenery on which I believe a very lucrative tourist industry will be based. And lastly, our brains, of which New Zealanders have a lot, and our good education system. Our scarce resources are imports and labour, which is therefore naturally costly, as reflected in our high standard of living.

The sort of manufacturing industries which I should expect to see developing as exporters are those again which do not use a lot of expensive resources such as labour or imports, but cash in on the cheap resources - either on natural resources such as with industries like forest products, food processing, etc., or on human resources such as agricultural chemicals and some electronics where the basic requirement is a large input of trained intellect and brain power in design and execution, rather than a large input of muscle.

In this connection I feel it is significant that the fastest growing exports in the list you compile every month are (after you take out the by-products of the refinery) processed foods and chemicals, and I think on comparative cost grounds, this will continue.

Products which require a large, cheap, unskilled labour force, or for which there are, with a large output, considerable economies of scale, are best imported from overseas suppliers whose resource situation is appropriate. In saying this I am only facing the facts and restating the classical laws of comparative advantage on which is based, at any rate to date, New Zealand's achievement of a very high standard of living.

7. AGRICULTURAL EXPORT PRICES AND THE TERMS OF TRADE

A much more rapid expansion of manufacturing and a slower growth of agriculture would be justified if it was certain that we faced a situation of diminishing returns in marketing agricultural products, due to falling export prices resulting from our own increased volume of exports.

This is a large subject to which the Lincoln Research Unit is devoting a lot of attention by formulating demand projections for our main export products in main markets.

Some of the results of our research have already been published.⁽¹⁾ For dairy products successful exploitation of the Japanese market over the next decade, including of course development of reciprocal trade, could absorb all and more of a 4% per annum increase in dairy production. In fact even with quotas in the United Kingdom, the rising volume of dairy production of recent years has all been sold in new markets other than Japan and in the form of a wide range of new products.

The Unit's research into the demand for wool,⁽²⁾ long ago indicated a sound long term future for wool. This has

(1) "A Market Target for the Dairy Industry" AERU Publication no. 16 by A.R. Frampton.

(2) "Wool in the New Zealand Economy" by B.P. Philpott, Economic Record, 1957.
"Fluctuations in Wool Prices, 1870-1963"; AERU Pubn.no.13, B.P. Philpott.
"Economic Implications of Increased Wool Production", AERU Publication no. 8 by B.P. Philpott.

turned out to be correct. We have had an enormous increase (50%) in wool production in New Zealand in the last decade and no evidence that this alone has had any adverse influence on prices received. In the season just concluded, New Zealand sold no less than 11 per cent more wool at a price only fractionally lower than last year, and this in a year characterised by the worst British economic crisis since the war.

Equally, with meat, provisional results from the Unit's marketing research programme suggest that while increased sales of lamb at 4 per cent per annum in the United Kingdom cannot be envisaged, there is still a large and growing unexploited demand; and this, together with vigorous exploitation of new lamb markets in North America and parts of Europe, an enormous potential mutton market in Japan will more than absorb our increased production.

I have, as you probably know, always taken a sanguine view about the effect on New Zealand agriculture of Britain's entry into the European Economic Community. Contrary to the predictions of many observers, the E.E.C. has, as some of us expected, turned out to be a large and growing net importer of agricultural products and as the pace of industrialisation quickens there, this trend I am sure will continue and increase.

The world terms of trade for agricultural products appear to be subject to long cyclic swings⁽¹⁾ and there is

(1) Trends and Cycles in Agriculture's Terms of Trade, B.P. Philpott, Proceedings of N.Z. Institute of Agricultural Science, 1961.

evidence to suggest we are now in an upward swing - if for no other reason than the sudden transformation into shortage of the world wheat situation with the emergence of Russia and China as very substantial and permanent importers.

For all these reasons, I see, therefore, no argument for supporting (on the grounds of declining terms of trade), the conclusion that a more rapid expansion of manufacturing production is desirable in place of agriculture.

There is however one matter related to the question of the future terms of trade which bears on future manufacturing development. I would hope that the types of manufactured products to which emphasis is given in the next decade are those for which it is expected import prices would rise, or at best not fall. We would not wish to see intensive specialisation on products which in five or ten years' time are going to be much cheaper on the world market than they are now.

This demands, on the part of manufacturers and those responsible for planning or guiding its destinies, an intensive programme of long term market research and forecasting - a matter to which I will return later.

8. THE PROVISION OF EMPLOYMENT

Agriculture, as we have seen, has been a very high capital user with very rapid growth in labour productivity but with a slowly declining labour force. Can rapid expansion of agriculture, and some "normal" growth in manufacturing, ensure full employment in the years ahead; or do we need forced growth of manufacturing with its greater labour requirements to absorb the growing labour force?

This latter view, as you know, has been frequently used as a justification for speeding up the growth of manufacturing.

I believe the view is quite mistaken or at best unproven. I take it your Association believes likewise, otherwise you would not be clamouring for greater immigration (which policy, incidentally, I also believe to be mistaken).

The surplus labour view I believe to be mistaken because it completely ignores the very high and growing indirect use of labour in agriculture. By this I mean the labour embodied in the inputs purchased from other sectors and in the additional capital equipment installed in agriculture each year, and further than this the labour required to make the equipment which makes the inputs which farmers buy.

In one of our research projects in the Research Unit, we are exploring, by the use of interindustry models, these indirect demands for labour and they are very considerable, firstly because agriculture's current account purchases from other sectors are very large (about £85 million or 10 per cent of its total current inputs in 1964/65); and secondly, because its import requirements, both on current and capital account, are so low.

Our provisional results in this interindustry research project⁽¹⁾ indicate that the indirect demand for labour, springing from increased agricultural production, is more than enough in conjunction with that springing from the normal growth of manufacturing and the rapid growth in tertiary production to absorb all of New Zealand's labour force.

Moreover there is every reason to believe that the type of job opportunities thus created are wide enough in their nature and scope to attract and absorb our output of scientists and technologists in various disciplines.

The relevance, for manufacturing, of what has just been said, is that labour is still a scarce, expensive resource in New Zealand and this supports my view expressed earlier that the most appropriate types of manufacturing should be those that economise on labour rather than those which "create employment".

(1) See B.P. Philpott "The Growth of Industries Ancillary to Agriculture", Lincoln College Agricultural Economics Paper no. 293.

9. PLANNING AND THE PRICE MECHANISM IN MANUFACTURING

From what has been said I conclude that alongside a rapidly growing agriculture there is an important place for normal, and not overstimulated, growth of efficient manufacturing industries and I come now to the final question of the policies required to secure development of the sorts of manufacturing industries which I have suggested are likely to contribute most to New Zealand's economic growth.

Let me first summarise, from what has already been said, the desirable characteristics of the efficient growth industries in the next decade. They are, I have suggested, industries which:

- (a) have large potential economies of scale;
- (b) can rapidly absorb new scientific research developments and exhibit rapid rates of technological change;
- (c) use New Zealand's natural resources including the human resource - the trained intelligence;
- (d) have low import content in capital equipment required;
- (e) earn or save foreign exchange per £100 of resources used to roughly the same extent as established exporters like agriculture, forestry and tourism;
- (f) economise on New Zealand labour content.

To secure selective development of these sorts of industries requires, it seems to me, greater use of the price mechanism plus sensible economic planning.

The Price Mechanism

In place of import control I would substitute a flat rate tariff on all imports, raw materials, capital equipment and finished consumer goods. The proceeds of this tariff, or part of them, could be used for a flat rate subsidy to exporters or part could be used to reduce income tax, thus conforming to the current drive for the substitution of indirect for direct taxes. Such arrangements would produce a greater degree of competition, the necessity for which I have alluded to above; and it would, by providing open recognition through the price system of the shortage of foreign exchange, ensure that efficient and economic saving and earning of foreign exchange was secured⁽¹⁾ and that industries, which did not conform to the desirable characteristics listed above, would not be encouraged to expand.

Exceptions to the basic protection provided by the flat tariff would only be granted by way of a higher tariff if the industry concerned could demonstrate that

- (a) it could, if granted the chance to expand, enjoy considerable economies of scale;
- (b) it is producing a product, the import price of which is clearly destined to become higher over the decade ahead.

This however may not be enough - in particular the correct decision needs to be made as to the required level

(1) Further analysis on the operation of the flat rate tariff is given in B.P. Philpott, "Criteria for Industrial Development", Lincoln College Agricultural Economics Paper no. 174

of fixed tax. The price mechanism needs to be supplemented (not supplanted), by economic planning.

Economic Planning for Manufacturing

There are of course as many ideas abroad as to what is meant by economic planning as there are people using this word with all its new-found popularity. To many people, including many manufacturers, it no doubt connotes the granting of special incentives to expansion. Let me hasten to say that this is certainly not what I mean by economic planning, and it is not what emerged from New Zealand's initial essay in planning, namely the Agricultural Development Conference. The dramatic increase in agricultural production, for which I believe the Conference was partly responsible, was not caused by new incentives - which have been largely non-existent (and in any case could not match for effectiveness the guaranteed shares of a market that many of you receive from import control). It has been caused by a new feeling amongst the industry of the need to increase production and reach targets set - a sort of esprit de corps, if I might call it that.

This is really what my idea of planning amounts to - the setting of targets, the laying down of a blueprint of what is desirable and what is achievable, and the ensuring, by appropriate policies, that they are brought into relation with each other, always remembering that there must be mutual overall consistency in the targets set for each sector and that the total resource requirement is not too great for the economy to bear.

Let me in the light of these remarks then outline what I feel would be the process of economic planning for manufacturing in New Zealand. The following are the steps I would envisage:

- (i) Individual industries would be asked to initiate market research to establish internal and external demand projections for their products, in the light of the New Zealand target rate of growth of real income of 4 per cent per annum, population trends, etc.
- (ii) Individual industries would also be asked (bearing in mind that they would be operating under the flat tariff rather than the import control regime) to establish the output trends which they envisage in the light of these market projections, and to provide an estimate of the capital and labour resources required to achieve these production targets, always allowing for the expected degree of increased efficiency.
- (iii) These market, production and resource requirement projections would then be aggregated into sector projections.
- (iv) The sector projections would then need review to check their consistency with
 - (a) the capital resources required by other sectors
 - (b) the labour requirements of other sectors and the need to ensure full employment
 - (c) the import requirements in relation to projected export income.

Such an exercise as this requires the use of an inter-industry planning model on an example of which we are working in the Lincoln Research Unit.

- (v) If from (iv) there turns out, by luck, to be overall consistency between the manufacturing targets and those of other sectors, then all is well and the targets can be widely promulgated.
- (vi) If consistency is not secured, say because total resource demands are too great or too small in relation to resources likely to be available, or because the plans still leave a projected balance of payments deficit (or happily, a projected surplus) or in any other way, then a solution of the optimum programme must be secured by rough methods of juggling around with the pieces or by the most exact methods of mathematical programming. The required degree of expansion (or contraction) of manufacturing, as revealed by this exercise, would then be secured by changing the level of flat rate tariff in the required direction and changing the proposed targets accordingly.

This process of target setting of course needs continual revision as time goes by and the whole exercise can be construed (as indeed is denoted by the term indicative planning used to describe it) as providing the industry with indications of what is expected of it to assist its own individual-firm planning accordingly.

The process I have described relies far more on the paper work of economists than on the incessant talk of conferences like the ill-conceived (and perhaps for this reason badly aborted) Industrial Development Conference.

For this reason some of you may not take kindly to my proposals but let me assure you that the mixture of price mechanism and planning which I have prescribed is much more in conformity with the spirit of your President's Annual Report in which he spoke of the need for manufacturers to be guided rather than be ordered.

A P P E N D I X

Notes on the Table giving Productivity Estimates (Section 2)

The estimates of gross domestic product by sectors are derived from Interindustry Study of the New Zealand Economy 1954-55, of the Department of Statistics. Estimates for 1964/65 were derived by applying to the 1954/55 figures, indexes of changes in net output. The derivation of these indexes is described in:

B.P. Philpott, Aspects of Productivity and Economic Growth in New Zealand 1926-64 A.E.R.U. Publication no.29.

The total of the individual sectors' gross domestic product, derived by this method, is exactly equal to that derived by deflating the similar aggregate figure given in National Income and Expenditure, Department of Statistics and in Volume of Production Supplements to the Monthly Abstract of Statistics.

Notes on the Determinants of Productivity Growth (Section 3)

The calculation of the proportionate share of capital and efficiency in increasing productivity is based on the method given in R.M. Solow "Technical Change and the Aggregate Production Function", Review of Economics and Statistics, August 1957, and the results are described in more detail in Philpott, op.cit.

Notes on Estimates of Capital Requirements (Section 5)

Estimates of real capital in agriculture are based on those previously published (in B.P. Philpott and J.D. Stewart Capital Income and Output in New Zealand Agriculture 1922-56, Economic Record, August 1958), brought up-to-date, and adjusted to exclude investment in rural houses. Figures of investment in the manufacturing industry form part of an A.E.R.U. research project on estimates of real capital by major sectors in New Zealand, the results of which are to be published in detail in a forthcoming A.E.R.U. publication. For manufacturing, the perpetual inventory method was used based on the official statistics in Report on Industrial Production Statistics in New Zealand of the Department of Statistics. The estimates of real gross investment here reported were the work of Mr G.C. Scott of the Agricultural Economics Research Unit.

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