NEW ZEALAND SEAPORTS

A thesis presented for the
degree of Doctor of Philosophy
in the University of Canterbury,
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Peter James Rimmer
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This thesis is presented in two volumes.

Volume I contains the text, Volume II the figures, tables and plates. The endpaper to Volume II is a general reference map of New Zealand.
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December 1964.
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ABBREVIATIONS

The following abbreviations are used in footnote citations of various journals.

Econ. Geogr. : Economic Geography.
Geogr. Rev. : Geographical Review.

Spelling

An alternative spelling of Tolaga Bay is Tolaga Bay.

Changes in the Names of Ports

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INTRODUCTION

It is the purpose of this study to determine and explain changes in the relative status of New Zealand seaports during two significant periods in the country's economic development, in an attempt to identify and understand the complex physical and human factors affecting the development of ports.

The origin and evolution of New Zealand seaports since the establishment of British settlement in 1840 has closely mirrored the nature and the direction of the economic growth of the country. Indeed, seaports as places "equipped to facilitate the necessary relations between ships as agencies of sea transport and the land"¹ have been of supreme importance in the development of New Zealand, particularly in view of the country's remoteness from the main concentration of population and markets in the world, the overwhelming dependence on international trade and the necessity of sea transport within and between the North and the South Islands.

In spite of their importance to the national economy seaports, in marked contrast to agricultural, pastoral, urban and manufacturing activities, have been neglected by geographers and workers in related fields. An economist has yet to attempt a comprehensive survey of the role of seaports in the national economy. Although there have been over thirty sizeable ports operating in New Zealand at various times, historians have provided only seven published studies on five individual ports.² Government departments, official organisations and private individuals also have been reluctant to undertake work in this field. Nor has the contribution of geographers been markedly

²Barr, John : The Ports of Auckland, Auckland, 1926.
Thompson, R.S. : Port of Otago, 2nd ed, Dunedin, 1945.
superior. There has been no work published by geographers on New Zealand seaports. Studies in geography have hitherto given little consideration to seaports, but rather have concentrated on the changing patterns of land use, settlement and population at significant periods in the country's development. The most fruitful source of background material has been provided by unpublished university theses on individual ports, aspects of a group of ports and the functions of coastal shipping. Most of the theses give an adequate description of the present status of ports, but do not go deeply enough into relationships underlying their past and present character. Thus, it is not surprising that there is little published information on New Zealand seaports.

The paucity of research and accessible literature on port geography in New Zealand has had important repercussions. For instance, without reliable information on the past development and functions of New Zealand ports it is difficult to forecast the future role of seaports. A pressing problem is how many ports should be maintained for the coastal trade in the light of road, rail, air and rail-ferry developments. Similarly, it is virtually impossible to make a reasoned assessment of H.M. Mayer's provocative suggestion for the nation-wide co-ordination of port planning, which would involve "the allocation of traffic among those ports best equipped to handle it, with the elimination of those which are least efficient and offering least potential for improvement." Bold planning along these lines requires a deeper appreciation of how ports have evolved in response to past and present stimuli.

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In an attempt to identify and understand the main factors underlying the development of New Zealand seaports, it is proposed to examine changes in their relative status during two significant periods in the economic development of the country. As the status of a port is a direct reflection of past development, a survey of the evolution of New Zealand ports is made in Part I, to put the analysis of the two selected periods in perspective. An idealised-type sequence of port development is evolved to provide a standard for comparing the development of New Zealand ports. By applying the idealised-type sequence to the distribution of ports at different times it is possible to gauge which ports have developed faster than others. The explanation of the differing rates of growth reveals the main factors that have affected the development of ports. Part I thus forms the background to the detailed analysis of the two periods in Part II of the study. Part II begins with a search for an acceptable measurement of the respective status of a port. In the hope of revealing the best measurement, a statistical experiment was set up to examine the available criteria. On the evidence of the experiment, the study proceeds to an analysis of the reasons behind the changes in the rankings of New Zealand seaports, in an endeavour to determine the critical factors producing the changes in status. The two periods are defined as follows:

(i) 1926 - 1936.

In this period the seaports are examined during the disruption of the New Zealand economy by the depression.


The status of ports is considered during a period of rapid economic development.

In each of the studies the respective roles of ports in the overseas, coastal and transhipment trade are treated separately. The overseas function is concerned with the transport of passengers, goods and mails at least 1,200 miles, whereas the coastal function is one of the alternative methods of transport for moving goods long and short hauls within and between the North and South Islands. However, the transhipment function involves the movement of goods between ships within the confines of New Zealand ports. The overseas trade has always been of great importance in the economic development of New Zealand as the country is virtually dependent on the sea as an avenue of supply, as well as a channel for export. In comparison, the role of the coastal trade
has continually been recast in the light of developments in transport, notably rail, road and air, to perform the necessary internal communications. The importance of the transhipment trade, however, has varied with the changes in the part played by ports in the coastal and overseas trade. From the contrasting studies of the functions of ports in the overseas, coastal and transhipment trade and the two different periods of economic development, an attempt will be made to gauge the relative importance of the various factors involved in the development of ports, and to provide an insight into the character of the present problems affecting New Zealand ports. Finally, in Part II, there is a discussion of the relevance of the study to the development of techniques by which ports may be compared and classified.

As the future seems certain to bring forth drastic changes in the existing pattern of New Zealand ports, an attempt is made, with the aid of the detailed analyses of the past patterns of port development and information on the predicted changes in the country's economic development, to construct a tentative hierarchy for the period 1963-1972 (Part III). It should provide a background to the effective planning of New Zealand seaports.
PART I

THE DEVELOPMENT OF NEW ZEALAND SEAPORTS
CHAPTER I

PATTERNS SINCE 1840

The first part of this study is concerned with the origin, development and changes in the status of New Zealand seaports since 1840. In theory, all possible sites for ports had an equal prospect of being developed. Thus, the selection of and emphasis on particular ports at different phases in the economic growth of New Zealand controlled their respective status. A study of the relevant factors involved in the changes and ranking of New Zealand ports, therefore, provides the basis for considering the dominant themes of the last fifty years.

A key factor in the changing status of New Zealand seaports has been the improvement of internal accessibility through the expansion of the transport network. From the beginning of organized settlement, the expansion appeared to be "at once a continuous process of spatial diffusion and an irregular or sporadic process" conditioned by many specific physical and human factors. Both processes have been at work in the development of New Zealand seaports. As there also seem to be broad regularities underlying the process of spatial diffusion in New Zealand, parallel to those recognised by Taffe, Morrill and Gould in the transport expansion of underdeveloped countries, it is possible to evolve a similar idealised-type sequence of transport development. The idealised-type sequence evolved in this study, however, focuses attention on the development of seaports, rather than on the expansion of the transport network as such. Greater emphasis, therefore, is placed on the changes in the organisation of maritime space, which is as essential to a port as the development of its landward connections. Incorporating both the changes in the maritime and landward transportation networks, the idealised-type sequence serves as a yardstick for comparing changes in the evolution of New Zealand seaports.

2 Ibid., pp. 503-29.
THE SEQUENCE OF PORT DEVELOPMENT

Three phases are recognised in the idealised-type sequence of the development of seaports (Fig. 2). The first phase (A) consists of a dispersed pattern of seaports scattered along the coast serving limited hinterlands. There is little interconnection between the ports, except for irregular visits of trading vessels and an indigenous mosquito fleet. Yet, with the emergence of the main lines of penetration into the interior (B), the hinterland costs are reduced for certain ports, enabling them to develop as marketing centres. The impetus derived from an expanded hinterland initiated the concentration of shipping at particular ports, as illustrated at \( P_a, P_b, \) and \( P_c \). Port concentration is accentuated, as \( P_a, P_b, \) and \( P_c \) develop as the foci for the feeder routes. As the feeder routes give rise to hinterland capture, the larger ports expand their influence at the expense of smaller ports, which either close or survive in an attenuated form. The feeders continue to develop until the interior and major ports are linked together in a transportation network. As \( P_b \) is linked to both \( P_a \) and \( P_c \), its development slackens, as it is subject to competition from the other two ports \( C \). It is, therefore, reduced to a secondary role, with less shipping and trade than \( P_a \) and \( P_c \). In this phase it is possible to recognise the major ports \( P_a \) and \( P_c \), the secondary port \( P_b \) and the surviving minor ports.

It is probably more realistic to think of the entire sequence as a process, rather than as a series of distinct phases. Thus, at a given point in time, the pattern of New Zealand seaports may reveal the co-existence of all three phases. It is convenient, however, to consider the sequence in phases.

THE FIRST PHASE: SCATTERED PORTS

In New Zealand it is possible to identify an early period of numerous small, scattered ports and coastal settlements with trading functions. When statistics were first published as a whole in 1853, there was already a dispersed pattern of ports. With 11 overseas ports of entry scattered throughout the country to serve a European population of 30,000, development was clearly taking place from isolated nodes, rather than from a single centre (Fig. 3A). 3

3 The use of the value of cargo to indicate variations in the status of ports (Fig. 3) is not without its shortcomings as the real worth of the pound sterling was subject to considerable fluctuation over the period. As the value of cargo was the only measurement available for the whole of the period 1853-1911, it is considered that the arbitrary choice of selected values to indicate changes in status is the best method available.
Yet, it was not a haphazard development. It reflected the genesis of organised settlement, grafted onto the surviving remnants at Russell, Wanganui and Hokianga of the preceding period of destructive exploitation of the natural resources of the land and the sea. Motivated by the desire to establish agriculture as the firm basis of settlement, the principal colonising bodies (the New Zealand Company and the Imperial Government) founded their colonies at Wellington (1840) with an offshoot at Wanganui (1842), Auckland (1840), Nelson (1842), New Plymouth (1842), Otago (1848) and Canterbury (1850) on, or adjacent to, fertile lowlands. Penetration lines from the settlements to the interior were weakly developed, but networks of tracks connected ports with restricted hinterlands. Further, as the lowlands were cut off from each other by rugged mountains, dense bush, a multiplicity of rivers and occasionally hostile natives, the need for interconnection by sea was paramount. With the exception of New Plymouth, the settlements were chosen with access to safe and commodious harbours to shelter the frail vessels - none of which exceeded 800 gross tons. As the services provided by the brigantines, top sail schooners, cutters and scows were irregular and infrequent, each port developed in some degree of isolation. Indeed, the geographical position of the ports could be represented by Edinburgh, Hull, Dieppe, Brest and Bordeaux, with the natural difference that there were no roads between any two of the ports for wheeled vehicles. The development of parochialism fostered during this period of isolation has been a persistent feature of the subsequent attempts to develop New Zealand ports.

4 See Carrington, F.A.: A Synoptical Account of the Making of a Harbour at New Plymouth, New Plymouth, 1868. Carrington made the shrewd observation that a site with good land but without a harbour had more chance of success than a good harbour with little fertile land.

5 Commodious was the adjective frequently used to describe the harbours serving the organised settlements. See 'Copy of Dispatch from Governor Hobson to the Private Secretary of State for the Colony, No. 41/39, from Great Britain Parliamentary Papers relating to New Zealand, No. 65, 1841 and His Hon. the Superintendent's Opening Address, Acts and Proceedings of the Wellington Provincial Council, session 1853-4.

6 Richards, G.H. and Evans, F.J.: The New Zealand Pilot, London, 1856, pp. 1-10. Much emphasis was placed on harbours of refuge for small ships to ride out a storm.

The full expression of the scattered distribution of ports did not eventuate until the spread of economic activity extended beyond the confining boundaries of the planned settlements. It occurred with such bewildering rapidity that by 1867 almost the whole range of possible sites for ports had been explored and examined (Fig. 3B). Shipping intelligence columns in contemporary newspapers revealed that 112 ports were in operation, of which 26 were overseas ports of entry. There were so many ports that a circle, or part of a circle, described around each one would give an average undisputed hinterland of only 25 miles.

The profusion of ports was the direct result of two agents. First, there was the spread of extensive pastoralism - based on merino sheep - onto the natural tussock grasslands of the South Island and the fern clad areas of the Wairarapa and Hawke's Bay. Secondly, there were the major discoveries of gold in Otago (1861), Westland (1865) and Thames (1867). The impact of the new developments did not affect all parts of the country as war with the Maoris inhibited economic progress in the North Island. But elsewhere, with the movement of activity away from the established centres, in search of gold and fresh pastures, effective communication by land became difficult and tenuous as the frontiersmen were soon separated from the original nuclei by physical obstacles. Dense bush, rugged, dissected mountains and swift flowing streams proved formidable obstacles to land transport. Only on the smooth Canterbury and Otago plains did conditions favour communications. Even here there were hazards to transport, as mile-wide, braided rivers, such as the Rangitata, Waimakariri and Waitaki, took their toll of early travellers who tried to cross them in time of flood (Plate I). At such an early stage in the economic development of New Zealand it is not surprising that railways were poorly developed. The total length - all in the South Island - was only 46 miles, in two separate sections, with two different gauges. Roads did little to remedy the situation, as the mountainous terrain, abundant rainfall and the

8 Of 70 ports whose limits were defined under the Marine Act 1867 59 were included in the first schedule. See 'Ports Scheduled under the Marine Act, 1867' New Zealand Gazette, 1868, p.549.

9 'Persons drowned in New Zealand Rivers 1860-1870' A.J.H.R., D.46, 1870. Up to 1870 1,115 persons were known to have drowned in New Zealand rivers.
lack of suitable roadmaking materials made roadbuilding difficult. Consequently, "made" roads radiated only 15-20 miles from the main settlements. Elsewhere, rough tracks through the bush, across unenclosed grassland, or along the beach, had to suffice. The transfer of heavy and bulky goods, such as wool or timber, on wagons driven by horse or bullock, was slow, tedious and costly (Plate II). "Generally we might say that the tractive power which drew two tons at home would not draw more than one ton in New Zealand." Even the coaches that ran along the "roads" had to be more resilient than their English counterparts, to enable them "to bend and twist about, ford rivers and go over the roughest ground". If the driver came upon a bridge broken by flood, "without hesitation he took the coach across a bit of a stream and then along broken ground rough with furze bushes, tussock, grass and the like, and without any road till he got back to the track".

As it is difficult to establish and finance effective land communications under these conditions, it is not surprising, in a newly settled country like New Zealand, that "the saltwater highway" was the most convenient and economic means of linking the scattered settlements in both islands. Almost every settlement established its own port to effect the reciprocal transfer of goods between the sea and the land. So dependent was the economic life of the country on sea transport, that the only concentration of population away from tidewater was on the alluvial goldfields of Central Otago.

Unfortunately, good harbours and pastoral, agricultural and goldbearing land did not coincide in New Zealand. Excellent harbours, such as those in Fiordland and the Marlborough Sounds, had to be ignored, and ports established at badly sheltered places which did not provide the basic requirements of all year round accessibility, sufficient depth and adequate protection. At least

53 ships negotiating New Zealand ports were grounded or wrecked in 1867.\textsuperscript{13} On the Hokitika bar alone as many as 32 ships foundered between 1865-67.\textsuperscript{14} The problem became so great at the port that the "West Coast Times" published a separate column for wrecks and strandings (Plate III). At this stage in the economic development of New Zealand, ports with dangerous bars, which were accessible only to ships of very small tonnage, were of "no trifling importance when the delay and difficulty attendant upon the transport by land in a new country were considered"\textsuperscript{15} (Plate IV). Most of the early ports have long since disappeared, destroyed by the growth of the main ports, or else they linger on as relict ports, with visits of an occasional coastal vessel to remind them of their heyday.

**THE SECOND PHASE : PENETRATION LINES AND PORT CONCENTRATION**

In theory, all ports had an equal chance of developing. But it was already apparent in 1867 that, despite the highly dispersed pattern of ports, there was a concentration of activity on a limited number of them (Fig. 3B). Dunedin, Lyttelton, Wellington, Auckland, Nelson, Hokitika and Greymouth, at the termini of the earliest penetration routes built to reach areas of mineral exploitation, to develop potential agricultural areas, and to establish military control in the North Island, had thrived at the expense of their neighbours. They had developed at the foci of maritime organisation by providing direct United Kingdom, trans-Tasman, inter-provincial and provincial services. As the seven ports collectively enjoyed a virtual monopoly of imports, they served as transhipment centres for the remaining ports. The importance of transhipment functions, coupled with their emergence as the main administrative and manufacturing centres, confirmed their dominance.

The incipient concentration of activity on a limited number of ports, recognised in 1867, was confirmed in 1881 by the impetus derived from the development of railway penetration lines. Between 1867-1881 the length of railways increased from 46 to 1287 miles. It was not in a connected network

\textsuperscript{14} Ibid., p.400.
but in twelve separate sections (Fig. 3C). Indeed, most ports developed their own railway connections with their hinterlands long before through lines were contemplated, much less completed. The general layout, therefore, was of short lines running from a port to an inland settlement. Although primarily intended as a means of opening up the country to settlement, railway construction had, in effect, given the port with a railway an advantage over its neighbours without a railway, for road transport beyond the main towns and shingle roads of the Canterbury plains was still slow, hazardous and primitive, despite improvements instituted as part of Vogel's public works programme. The expansion of the land transport network reacted on the organisation of maritime space also, as steamer services were established to serve the termini of the penetration lines. With the concentration of activity on the termini, the ports endeavoured to facilitate the loading and discharge of cargo by providing wharves, warehouse facilities and adequate depths.

The development of the penetration lines generated a series of spatial readjustments, as the comparative locational advantages of ports shifted. Port concentration was marked. By 1881 Dunedin, Lyttelton, Auckland and Wellington, collectively, monopolised the imports and exports, handling 80 per cent of the total trade (Fig. 3C). In contrast, many of the smaller ports lost their function in the external trade, because of the concentration.

THE THIRD PHASE. INTERCONNECTION AND PORT PIRACY

Penetration was followed by lateral interconnection as feeder lines moved out from the ports on the landward side. The process of concentration was accentuated by the feeder network of certain ports reaching out and tapping the hinterlands of their neighbours. As feeder networks became stronger, some of them connected the original penetration lines, enabling the larger port to expand its hinterland even further.

In 1881, the process permitted the greater concentration of trade on Dunedin and Lyttelton. The economic supremacy of these two areas derived from

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16 In the narrow Auckland peninsula the first railways (Auckland-Onehunga 1873, Auckland-Werder 1875, Riverhead-Helensville 1875) were portage railways, connecting ports on the east and west coasts.

17 The programme, instituted in 1870, was responsible for large scale immigration, land settlement and the development of roads and railways.
the continued development of the wool "monoculture" and the subsequent development of the bonanza wheat farms on the Canterbury and Otago plains, resulting in their hinterlands obtaining a larger share of the new transport developments than the rest of the country. Indeed, the idealised cycle of port development was completed on the east coast of the South Island by 1881, as all ports from Waipara to Bluff were connected by the 425 mile South Island Main Trunk railway (Fig.30). Some rationalisation of ports followed from the lateral interconnection, as many of the ports on the east coast of the South Island were closed or reduced in status by 1881, because they had been deprived of a large proportion of their trade.

Although the lateral interconnection of ports was achieved on the east coast of the South Island between 1867-1881, the short lived phase of the development of penetration lines from Timaru and Oamaru was sufficient for these ports to develop resistance to competition from Dunedin and Lyttelton. They continued to develop their artificial ports despite the strong competition brought by the railway (Plate V). This competition was intensified by the railway rates, which were designed to concentrate cargoes on larger ports at the expense of the smaller ports. It was claimed at the time that the penal rate system operated by the railways was an important factor contributing towards the bankruptcy of the Oamaru Harbour Board. Yet, in spite of the difficulties, both Oamaru and Timaru survived, as vested interests were determined to retain them as outlets for their respective districts. "But, argue some people, New Zealand does not require these secondary ports. In the cases of Timaru and Oamaru, Lyttelton lies to the north and Port Chalmers to the south, each connected by railways made at great expense to the colony." The mere successful construction of an artificial harbour was not considered a necessary or justifiable reason for retaining a port, once the town was connected to a railway. However, the full development of the ideal sequence in the South Island, which would have eliminated Oamaru and Timaru, if it had continued to its logical conclusion, was thwarted by fierce local patriotism and heavy capital investment in harbour works.

19. The Oamaru Harbour Board was in the hands of the receiver from 1893-1911.
The persistence of the secondary ports, such as Oamaru and Timaru, was apparent when the development of feeder routes and interconnections expanded in areas outside the favoured east coast of the South Island where, hitherto, the expansion of the transport network had been retarded by the highly dissected topography (Plate VI), extensive forests and recurring native troubles. Stimulated by the opportunity of exporting frozen meat, butter and cheese to the United Kingdom, after the first successful export of refrigerated produce in 1882, communications expanded rapidly in the North Island, for the combined efforts of the sawmiller and farmer transformed the bush into exotic pastures.

As the prime means of opening up areas to settlement, the railway system expanded to 2,759 miles in 1911, involving the linking of many separated lines, including the North Island Main Trunk line between Wellington and Auckland (1908). When the link up affected ports which had developed in some degree of isolation, fierce competition often resulted and smaller ports were deprived of a large proportion of their trade. Certain ports, such as Napier, New Plymouth, Wanganui and Waitara, survived the link up, even though the accompanying development of shipping outstripped their capacities. Vessels had to be lightered in the roadstead as they were too large to enter the confines of the port (Plate VII). Yet, the ports survived because they specialised in exporting refrigerated produce, which was expensive to move long distances on account of its perishable nature and high bulk in relation to value. In contrast, where the relatively high value, low bulk and non-perishable imports were concerned, the expansion of the transport network permitted Wellington, Auckland, Dunedin and Lyttelton to develop at the expense of other ports linked to the railway system. In 1911, their aggregate share of the imports increased to 85 per cent, as their main railway connection and subsidiary coach routes enabled them to serve a wide area more effectively.

In addition, a further series of spatial processes was set in motion within the main group of ports. The positions held by Dunedin and Lyttelton,

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22 Only eight per cent of the European population were more than ten miles away from the railway line. The Railways Report', A.J.H.R. D.2, 1911.

23 An idealised-type sequence of the changes in the detailed layout of New Zealand seaports is to be found in Appendix 1.
in 1881, were usurped by Wellington and Auckland by 1911 (Fig. 3D). These changes resulted from the acceleration of economic development in the North Island, which enabled the North Island to outstrip the South Island in population and volume of trade. With the parallel expansion of the transport networks in the North Island, Wellington and Auckland obtained the greatest share of the trade generated by the new activities. Indeed, Wellington emerged as the leading port of New Zealand in 1911. The port received more ships than any other centre to load frozen meat, butter and wool, as almost all the produce from the well-developed farming areas of the Wairarapa and the Manawatu were exported through Wellington. However, Wellington's main strength was derived from her unique position in connecting the transport network of both islands and the main overseas shipping lines. It was admirably situated to serve the almost balanced population of the two islands. Wellington, therefore, superseded Dunedin as the Dominion's main distribution centre. Many firms, with headquarters in Dunedin, moved to Wellington to obtain the benefits of the capital's central position. It was claimed that Dunedin contributed to its own downfall, as high import charges and fewer direct shipments from the United Kingdom precipitated the departure of a large number of firms to the North Island. Dunedin's decline appeared virtually inevitable with the movement of business and population to the North Island.

The full concentration of trade and shipping on a limited number of ports, as envisaged in the idealised-type sequence, was not yet fully realised in 1911. There were still ports serving areas such as Northland, the East Coast (Plate VIII) and the Bay of Plenty in the North Island, and the West Coast, Marlborough, Nelson and the Lake District in the South Island, which had not reached the third phase in the ideal sequence of transport development. Even at the beginning of the detailed survey of New Zealand seaports in 1926, the ports serving these areas — with the exception of Hokitika and Greymouth, which were linked to the South Island Main Trunk railway in 1923 — continued

24In 1911 Wellington was the first port of call for the United Kingdom mails (via Suez), the main passenger terminal and the main port in the trans-Tasman trade linking the Sydney via Auckland and the Melbourne via Bluff routes.

to thrive in the absence of effective competition from other ports. Indeed, the ports retained their independence until either the further extension of the railways (Plate IX) or the development of road transport (Plates X and XI) successfully integrated them into the main transport network.

The expansion of the transport network had, therefore, a direct impact on the changes in distribution and ranking of New Zealand seaports. It is clear that its unfinished character was to be a cogent factor in explaining why certain ports developed more rapidly than others, in the detailed analysis of ports between 1926-36 and 1950-61.
PART II

AN ANALYSIS OF THE CHANGING STATUS
OF NEW ZEALAND SEAPORTS
Introduction

In the search for the critical factors associated with the distribution and relative importance of seaports, the second part of the study is concerned with the interpretation of changes in the respective status of seaports during two significant periods in the development of the New Zealand economy. An explanation of the trends and directions of change in the status of New Zealand seaports is important in providing the basis for a reasoned assessment of their present and future potentialities. Without a full grasp of past developments there is a danger of confusing transient conjectures of circumstance with basic structural patterns.

A reasoned assessment of New Zealand ports is conditioned by the possession of data that will properly describe their character, importance and location. It is not possible to delve deeply into the factors associated with changes in the status of New Zealand ports until the publication of new and refined statistics after 1922. The publication of these statistics does, however, pose a problem as to what is the best measurement of a port's status. In the first part of the study, the value of foreign commerce was used as the criterion, as figures for this were the most readily available. The second part of the study aims at a deeper interpretation of the changes in status than was given in the first part. Thus, a fuller consideration of the available criteria is necessary. A statistical experiment is, therefore, set up to investigate which of the available criteria will provide the best measurement of a port's status (Chapter II). On the basis of the evidence of the experiment an analytical framework is established (Chapter III), and the study proceeds to detailed analyses of the two selected periods, 1926-36 (Chapter IV) and 1950-61 (Chapter V).

The seaports are examined at the beginning and end of each period to discover changes in their respective status. The critical factors associated with the variations in status are then identified and examined. An integral part of the examination is testing the cogency of the ideas and formulations distilled from the available literature on seaports, to see if they have any relevance to New Zealand conditions. It is hoped to clarify some of the ideas and to develop, in the process, new tools for interpreting changes in the status of seaports. From the two analyses, it will be possible to see if the factors applicable to ports during a recession in the New Zealand economy (1926-36) are pertinent to a period of rapid expansion (1950-61).
Geographers interested in the relative stature of seaports have speculated for years about the best measurement for comparing and classifying ports. Although many detailed studies have been made of individual ports, there seems to be no acceptable scale against which the activities or relative stature of any given port can be measured. Yet, there is implicit in the literature the assumption that some of the measurements are to be preferred to others.

Morgan, for example, has contended that the net registered tonnage of shipping\(^1\) using a port "is the most comprehensive figure for evaluating ports as places concerned with the arrival and departure of ships.\(^2\)" The advantage of net registered tonnage is that it applies to all ports, except naval bases, and includes all ships that come to a port. It embraces all classes of traffic - "the passenger liner with little cargo and a high net tonnage figure, the cargo liner, the passenger-cargo liner, the tramp with a great weight of cargo for its net tonnage figure, the cargo liner, the tanker, the collier and the packet or ferry steamer.\(^3\)" But the use of net registered tonnage over a lengthy period of time has been criticised. Marine architects have tried to keep the figure as low as possible, for wharf dues are charged in proportion to net tonnage. In other words, they try to reduce the net registered tonnage relative to the carrying capacity of the ship.\(^4\) Consequently the growth of net

\(^1\) Net registered tonnage (n.r.t.) is gross registered tonnage (the measurement of the enclosed volume of a vessel, 100 cubic feet being taken as one ton) less an allowance for machinery and crew space.

\(^2\) Morgan, p. 17.

\(^3\) Ibid., p. 17.

tonnage falls short of the actual growth in the capacity of shipping. 5

The shortcomings of net registered tonnage has led to Alexandersson and Norström, 6 Weigend 7 and Ullman 8 to select the weight of cargo, given in measurement tons, 9 as the most satisfactory single measure of the size of a port. There are drawbacks in the use of measurement tonnage, as it favours ports handling bulk cargoes. Under this system seaports specialising in handling coal and oil cargoes rank among the leading ports in the world. Hampton Roads, for example, would surpass New York as the premier importing centre of the United States, on account of its large oil intake. 10 Many ports are not very significant on account of the weight of cargo handled, although they are visited by a large net registered tonnage of shipping. If the weight of cargo were used as the sole criterion, the importance of these ports would be undervalued.

The alternative measurements - the number of ships, the value of cargo and indices relating to the physical capacity of the port - have all been rejected. 11 As ships vary in size, it is claimed that their numbers do not provide a good indication of a port's status. It would be possible for one ship to carry more cargo than four others. The fluctuating worth of the pound sterling has led to a repudiation of value. Also eliminated were indices relating to the size of individual ports, such as the number of berths of 600ft. with 38ft. alongside at Wellington, and the number at 550ft. with 32ft. alongside at Timaru. Writers claim that there is a danger in drawing conclusions from such indices. Within the port of Otago, for example, Port Chalmers can accommodate larger ships than Dunedin, but the latter receives and dispatches

5 Net registered tonnage statistics in New Zealand are inflated by the ferries in shuttle traffic between the North and South islands.
9 A measurement ton was originally the space occupied by a ton of wine which was 50 cubic feet. It is now 40 cubic feet, approximately equal to four quarters or a short ton of wine.
11 See Morgan, pp.16-17. Alexandersson and Norström, p.118.
more shipping and cargo.\textsuperscript{12}

Behind the acceptance and rejection of all measurements is the assumption that a single criterion is sufficient basis for assessing the status of a port. However, a measurement of status, based on a single criterion, is subject to any abnormalities it might exhibit. It may not, therefore, provide a good measurement of ports with divergent functions. There have been attempts to overcome the problem by combining two or more measurements. Bird, for example, used two different measurements - net registered tonnage and value.\textsuperscript{13} Carter proposed a multi-criteria system for describing and differentiating between United States ports.\textsuperscript{14} Six different measurements were used to construct a series of maps depicting important traffic characteristics of ports. From an analysis of the maps, Carter concluded that the multi-criteria system was more comprehensive and more widely applicable than a single criterion for gauging the status of a port. If Carter's premise is accepted, the next step is to combine his criteria as ratios or formulae.

Before progress can be made along these lines, three questions require investigation.

(i) How much difference is there between the various criteria for measuring the status of ports? Can the superiority of one criterion be established statistically?

(ii) If there is such a measurement, would it also be valid for overseas and coastal trade?

(iii) Would such a measurement be applicable to several different years, or is it useful for only one specific year?

PROCEDURE

To see if the superiority of one criterion for measuring ports can be established statistically, an investigation was undertaken of the gross, overseas and coastal trade of New Zealand seaports for four different years - 1926, 1927, 1928, and 1929. The respective controlling depths at Port Chalmers and Dunedin are 30ft. and 23ft. But in 1961 84 per cent of the cargo was handled at Dunedin and only 16 per cent at Port Chalmers.

\textsuperscript{12}The respective controlling depths at Port Chalmers and Dunedin are 30ft. and 23ft. But in 1961 84 per cent of the cargo was handled at Dunedin and only 16 per cent at Port Chalmers.


\textsuperscript{14}Carter, Econ. Geogr. 38, pp.162-75.
1936, 1950 and 1961. The basic problem was to seek the coefficients of correlation between the several possible measurements for the gross, overseas and coastal trade of New Zealand ports.

The first task was to select the criteria for individual ports from a variety of sources for the years in question. The New Zealand Port Information Manual provides details of the respective length of berthing, the limiting depths at the harbour entrance, in the fairway and alongside the berths, the various types of mechanical equipment available and the maximum draught of shipping permitted at individual ports. As there were still roadstead ports in operation, which had no berthing or mechanical equipment for all the years being analysed, it was decided to choose the maximum draught of shipping as the representative measure of a port's physical status. Four further measurements of a port's status are given in the Report on the Transport Statistics of New Zealand. First, there is the weight of cargo given in "measurement tons" loaded and discharged in the overseas, coastal and transhipment trade of New Zealand seaports. Secondly, there is the number of commodities landed and shipped in the overseas coastal and transhipment trade of the majority of ports. Thirdly, there is the number of overseas and coastal ships visiting a port each year. Fourthly, there is the net registered tonnage of overseas and coastal shipping visiting each port given in two tables. There is one that enumerates, for the overseas trade, the ports at which they have first "entered" to discharge cargo, and where they "cleared" their last port of call. The other distinguishes, by ports, the number of calls made by shipping engaged in either the

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15 For the purpose of the experiment transhipments were included in the overseas and the coastal trade.


17 N.Z. Marine Department, New Zealand Port Information Manual, Part I Text, Part II Plans, Wellington, 1957

"coastwise" trade, which is between any two ports in the home country or islands in the home seas, or the "overseas" trade, which is from or to a port outside the home country. As the first table is based on the location of the respective ports, Bluff and Auckland at the northern and southern extremities of New Zealand always get a disproportionate share - the statistics in the second table have been used. Finally, the New Zealand Official Yearbook lists the value of trade in pounds sterling, but for overseas trade only. There are no comparable figures of value for the coastal trade. New Zealand publications, therefore, provide six measurements for the overseas trade, but only five measurements for the gross and coastal trade.

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<tr>
<th>GROSS</th>
<th>OVERSEAS</th>
<th>COASTAL</th>
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<tr>
<td>1. net registered tonnage</td>
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<td>2. weight of cargo</td>
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<td>3. different commodities</td>
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<td>4. number of ships</td>
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<td>5. maximum draught</td>
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<td>5. maximum draught</td>
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<tr>
<td>6. value of cargo</td>
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With the above data for individual seaports, it would be possible to construct a set of five maps of the gross measurement for each of the four years. If the maps showed the same pattern, the absolute measurement of a port's status would be immaterial. In an attempt to discover if the relationships between the measurements are consistent for the overseas and coastal elements of the gross figures, two further sets of five maps could be drawn for each of the four years. However, the construction of 15 maps for each year is a crude method of proceeding with the problem, as even if the maps showed a high degree of correlation, it is impossible to compare them, except visually. On the basis of existing evidence, it appears that the visual comparison does not "provide an effective means of determining or demonstrating the degree of association that exists between sets of spatially distributed phenomena". Without depreciating the value of visual inspection for the analysis of correlation, it is not possible to derive a precise measurement of variation.

19 New Zealand Official Yearbook, Wellington, (published annually since 1892).

by inspection alone. In situations involving lesser degrees of association, the procedure must be viewed as an inadequate substitute for measurement where a determination of the extent of such an association is required.

The decision was made, therefore, to run a correlation analysis of the gross, overseas and coastal criteria for each of the selected years. To control the investigation, the same ports were included for 1926 and 1936, and for 1950 and 1961. This was necessary because the data for certain ports was not complete, owing to the fact that they were in use in one year and closed in the other. They were, therefore, omitted from the investigation. Consequently, the percentage of the total universe, represented by the base number of observations, is given for each year.

Data for the gross, overseas and coastal measurements of individual ports was put on punch cards which were then processed on I.B.M. 1620. The Pearsonian coefficients of correlation were computed for each pair of variables.

THE RESULTS

The Gross Measurement

Table I shows the correlations of the five criteria of gross measurement for individual ports in the four selected years. With more than 36 observations for New Zealand as a whole in 1926 and 1936 and 26 observations in 1950 and 1961, the tests for significance indicate that all the coefficients computed in the investigation are meaningful, that is, all coefficients are sufficiently different from zero to be judged statistically significant at the

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21 The definition of the Pearson product moment coefficient of correlation is

\[ r = \frac{1}{N} \sum (x - \bar{x})(y - \bar{y}) \]

\[ \sigma_x \sigma_y \]

where \( \bar{x} \) and \( \bar{y} \) are the mean of all the \( x \) values, mean of all the \( y \) values, and \( \sigma_x \) and \( \sigma_y \) are the standard deviations of all the \( x \) values and all the \( y \) values. The product term \( \frac{1}{N} \sum (x - \bar{x})(y - \bar{y}) \) is the covariance of \( x \) and \( y \). The correlation coefficient \( r \) cannot exceed +1 or be less than -1 in value. A value of +1 denotes perfect functional relationship between the variables, an increasing \( x \) being associated with an increasing \( y \). Where \( r \) is equal to -1, again there is a functional relationship, but this time an increasing \( x \) is associated with a decreasing \( y \). Where \( r = 0 \) there is no relationship at all between \( x \) and \( y \). As all the coefficients in the above experiment were positive, increasing \( x \) was associated with increasing \( y \).
The tables reveal that there is a relatively high positive correlation between the five criteria. In all four years cargo tonnage was most highly correlated with the other variables. In particular, there was a close relationship between cargo tonnage and net registered tonnage and the number of ships (over .90 in all four years). The experiment suggests that cargo tonnage is the best single measurement of a port's status. Net registered tonnage and the number of ships provide the best measurement after cargo tonnage. The number of different commodities is not so valuable, while the maximum draught of shipping is least useful. Neither the number of different commodities nor the maximum draught of shipping show a consistent relationship with other variables (Fig.4). There is, however, a remarkable stability through time in the relationship between cargo tonnage, net registered tonnage and the number of ships, as there has been little change over time in the respective order of variables.

Measurements of Overseas and Coastal Components

1. The Overseas Component

Table II shows the correlations of the overseas components of the gross measurements for each of the four selected years. With 17 observations for New Zealand as a whole in 1926 and 1936, and 16 observations in 1950 and 1961, the tests for significance indicate that all the coefficients are sufficiently different from zero to be judged statistically significant at the .01 level of probability. The tables reveal that there is a higher association between all five criteria than in the gross measurement. For three of the four years - 1926, 1936 and 1950 - the measurement most closely associated with the other five criteria was net registered tonnage. In 1961 the number of ships provided the best measurement. But the high correlation between net registered tonnage, cargo, number of ships and value (all over .90) suggests that any of the four criteria would be equally useful as a measurement of an overseas port's status, for they provide essentially the same pattern. The number of different types of cargo is not quite so valuable (coefficients range between .80 - .90), while the maximum draught of shipping is least useful (coefficients range between .65 - .85). In spite of the great changes in economic conditions

22 The value of cargo is also included in the experiment for the overseas component.
affecting the overseas component, there was a remarkable stability through
time in the respective order of relationships between criteria (Fig.5).

ii. The Coastal Component

Table III reveals the coefficients of correlation of the five criteria
for coastal ports in the four selected years. With 36 observations for New
Zealand as a whole, in 1926 and 1936, and 26 observations for 1950 and 1961,
the tests for significance indicate that all the coefficients are meaningful at
the .01 level of probability. The association between the criteria is much
lower than for the overseas component and the gross measurement. In one
instance only does a coefficient reach .90. The measurement most closely
associated with the other criteria is the amount of cargo. It is the best
measurement of a port's status for all four years. None of the other
measurements shows the consistency of cargo. Indeed, the low rating of the
other measurements makes one wonder if a ratio or formulae could be evolved for
coastal ports. As with the overseas component, there is stability in the
respective order of relationships over time (Fig.6).

Summary

From the investigation, some notion of the variations in significance
between the different criteria is apparent. On the basis of the evidence,
cargo tonnage is the best single measurement for gauging the status of New
Zealand ports in all four of the selected years. It is also clear that the
overseas and coastal components must be considered separately in view of the
marked difference between the criteria.

THE APPLICATION OF THE MEASUREMENT

As the interpretation and explanation of a port's rank are critical
to the study, it is important that the implications of using cargo as a means
of gauging a port's status are understood. In any consideration of the cargo
statistics, it is advisable to note that the term "ton" does not invariably
denote a weight of 2,240 lbs. It is practicable to obtain the actual weights
involved for only a small portion of the goods handled. In other cases
approximations are made by applying uniform formulae as to the number of bales,
cases, sacks etc. to the ton. A considerable portion of trading goods,
however, is recorded in measurement tons, 40 cubic feet being regarded as the
equivalent of a ton. As the practice is uniform, comparisons from year to year are not appreciably affected, nor are comparisons between ports, unless there is a radical difference in the class of trade carried on, in which case recourse has to be made to a consideration of individual items of trade. Since a much larger proportion is in measurement tons - thus artificially swelling the figures - direct comparison of import cargo tonnage with export is invalid. Thus, in any interpretation of changes in status, exports and imports have to be considered separately.

The evidence and conclusions just presented suggest several problems:-

(i) Would there be any merit in employing a linkage analysis (or similar grouping technique) to isolate clusters of similar coefficients, provided several related measurements of ports are used, such as the size and structure of population, the productive capacity of the hinterland and the number of shipping agents.23

(ii) There is no means of determining whether a correlation coefficient is high enough. It means a subjective judgement has to be made to determine the degree of exactness required.

Although both problems are worthy of further research, the present study is able to proceed to the detailed analysis of the two selected periods 1926-36 and 1950-61, using the amount of cargo tonnage as the measure for ranking ports.

Long or short term trends?

There is, however, one other conceptual problem inherent in the approach to the study. It is assumed that the changes between initial and terminal years in the two selected periods are indicative of long term trends. The question arises, however, as to the extent to which the conclusions may be influenced by the choice of a particular year. It is desirable to know if the results truly reflect long term trends, or if they represent abnormal circumstances of a fortuitously chosen year.

In an attempt to gain some insight into the problem, an investigation was set up to discover the extent to which the changes in rank 1926-36 (1950-61) differed from an average of the changes in rank for 1926-35 and 1926-37 (1950-60 and 1950-62). The procedure was to obtain Spearman's rank

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correlation coefficient for each of the two sets of years viz:-

(i) \[ R_{1926-36} : \frac{R_{1926 - 35} + R_{1926 - 37}}{2} \]

(ii) \[ R_{1950-61} : \frac{R_{1950 - 60} + R_{1950 - 62}}{2} \]

where \( R \) is the change in rank of the port between two selected years. The results of the procedure gives support to the view that the conclusions of the study are not likely to be influenced by the choice of a particular year, as the Spearman coefficient of rank correlation for 1926-36 and the average for 1926-35 and 1926-37 is +.988, and for 1950-61 and the average for 1950-60 and 1950-62 is +.963. The following chapter incorporates the results of the statistical experiments into the method of analysis for examining changes in the status of ports between 1926-36 and 1950-61.

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24 Spearman's rank correlation coefficient is defined by

\[ r = 1 - \frac{6 \sum d^2}{n^3 - n} \]

Where \( d^2 \) is the sum of the squares of the rank differences and \( n \) is the number of observations. The rank correlation coefficient has been designed so that when two rankings are identical the rank correlation has the value of plus 1; when the rankings are as greatly in disagreement as possible i.e., when one ranking is the reverse of the other the rank correlation coefficient is equal to minus 1.
A study of comparative change

On the basis of the foregoing statistical experiment, the criterion of cargo tonnage is applied to a comparative analysis of New Zealand seaports, first in 1926 and 1936, and secondly in 1950 and 1961. The method of analysis - set out diagramatically in Figure 7 - is to obtain a measure of the relative importance of ports for the selected years by breaking down the gross tonnage into individual port totals. A basis for interpreting the changes in the status of ports is provided by ranking ports according to their percentage of the gross tonnage in the initial and terminal year.

Implicit in the variations in the ranking of ports on the gross tonnage scale are changes in concentration. Thus, port X with 3.7 per cent of the gross tonnage in 1926 and 5.6 per cent in 1936 experienced an increase in concentration of 1.9 per cent. These changes in concentration are made explicit by translating them into absolute terms, by calculating the difference between the actual tonnage of a port in 1936 (or 1961) and hypothetical figures showing what the tonnage would have been if the port had grown at the national rate between 1926-36 (or 1950-61). The formulae for calculating the difference between the actual and hypothetical tonnage is:

\[ y_p = x_p - H_p \]

where

- \( y_p \) = comparative gain or loss
- \( H_p \) = hypothetical tonnage of port
- \( x_p \) = tonnage of port in initial year

\[ X_{NZ} = \text{tonnage of New Zealand ports in initial year} \]
\[ Y_{NZ} = \text{tonnage of New Zealand ports in terminal year} \]
\[ Y_p = \text{tonnage of port in terminal year} \]

This is, therefore, a study of comparative change. Ports which grew more rapidly than New Zealand as a whole are said to have "gained", while ports which grew less rapidly are said to have "lost".

The emphasis on comparative growth is consistent with the purpose of the study and fundamental to the analysis of the changes in the status of ports. It should be constantly borne in mind that the growth of each port is being appraised against the national rate of growth, and that reference to comparative "gain" and "loss" is simply a convenient way of describing rates that were faster or slower than the New Zealand average. Under this system it is possible for a port to record a comparative loss and yet record an absolute gain. The study of the comparative growth that follows should, therefore, be interpreted and evaluated in terms of the absolute growth or loss evidenced in the accompanying tables.

Before interpreting the comparative changes in the relative position of ports, it is necessary to break-down the gross tonnage in successive steps into its overseas (II O), coastal (IIC) and transhipment (IIT) components, as their contribution varied spatially and temporally among individual centres. The ports are, therefore, ranked separately, first in the overseas trade (II O1), secondly in the coastal trade (II CI) and finally in the transhipment trade (II TI). Changes in the rankings of ports in each of the three types of trade, are converted into absolute terms by calculating the difference between the actual and hypothetical change between 1926 and 1936 (and 1950 and 1961). The variations in the overseas trade are interpreted in terms of the comparative changes in imports (II OI) and exports (II OE), the coastal trade in terms of the comparative changes in receipts (IICR) and shipments (IICS) and the transhipment trade in terms of the movements between coastal and overseas vessels (IIT). After the three separate analyses in the overseas (II Oii), coastal (IICIi) and transhipment trade (IITi), the results are drawn together to account for the changes in the rank of ports on the gross tonnage scale (Iii).

In evaluating the reason for the changes, personal judgement necessarily plays an important role. Change in the status of ports is a complicated
process, which involves the interaction of many different physical and human factors. The inferences drawn in the succeeding analyses can, therefore, only be considered tentative and subject to such revision as additional data, improved analytical tools and fresh insights make possible.
CHAPTER IV

CHANGES IN THE STATUS
OF NEW ZEALAND SEAPORTS
1926-1936.
CHANGES IN THE STATUS OF NEW ZEALAND SEAPORTS 1926-1936

II AN ANALYSIS OF THE GROSS TONNAGE RANK

Changes in Status
Changes in Concentration

IIO OVERSEAS TONNAGE

Changes in Status
Changes in Concentration

IMPORTS

Changes in Concentration
Explanatory Variables

(i) changes in the population of the inferred hinterlands of the respective ports.
(ii) the growing trend towards centralization of the economic life of the country on Auckland and Wellington.
(iii) changes in a select group of commodities.

EXPORTS

Changes in Concentration
Explanatory Variables

(i) changes in the pastoral group of commodities.
(ii) the trend towards centralization on the "main ports".

IIIC COASTAL TONNAGE

Changes in Status
Changes in Concentration

The Pattern of Analysis
An Examination of Shipments and Receipts

SHIPMENTS

RECEIPTS

The General Factors

(i) changes in consumption.
(ii) changes in the standard of living.
(iii) changes in government policy regarding imports.
(iv) changes in manufacturing.
(v) changes in fuel technology.
(vi) changes in the significance of different methods of transport.
   (a) changes in road and rail transport.
      (1) intra regional movements.
      (2) intra island movements.
      (3) inter island movements.
   (b) changes in overseas shipping policy.

The Regional Conditions

THE NORTH ISLAND

1. THE AUCKLAND REGION

Shipments
Receipts
2. THE POVERTY BAY REGION
   Shipments
   Receipts
3. THE HAWKE'S BAY REGION
   Shipments
   Receipts
4. THE WEST COAST (N.I.) REGION
   Shipments
   Receipts
   THE SOUTH ISLAND
5. THE MARLBOROUGH REGION
   Shipments
   Receipts
6. THE NELSON REGION
   Shipments
   Receipts
7. THE WEST COAST (S.I.) REGION
   Shipments
   Receipts
8. THE EAST COAST (S.I.) REGION
   Shipments
   Receipts

IIT TRANSJSHIPMENT TONNAGE

   Changes in Status
   Changes in Concentration
   Explanatory Variables

   (i) improvement in road and rail communications.
   (ii) alterations in the pattern of direct shipments.
   (iii) changes in select commodities.

II.1 INTERPRETATION OF THE GROSS TONNAGE RANK
CHAPTER IV

CHANGES IN THE STATUS OF NEW ZEALAND SEAPORTS 1926-1936

The depression of the thirties produced a ferment in the rankings of New Zealand seaports (Fig.8). When cargo statistics were first published in 1922, there were 50 ports handling 6.6m. tons. Then followed a substantial increase in cargo tonnage until the depression affected New Zealand in 1930 (Table IV). There was a marked decline in the ensuing years reaching the lowest point of 5.6m. tons in 1933. Then followed a resurgence in the general economic conditions with a consequent increase in the volume of tonnage handled. By 1939, when the recovery had reached its peak, there were 45 ports handling 8.3m. tons. In an endeavour to describe and interpret the effect of the depression on the status of seaports, the rankings of ports are analysed in 1926 and 1936 when ancillary census material is available. In 1926 48 ports handled almost 8.1m. tons, whereas in 1936 47 ports dealt with over 7.5m. tons—a decrease of ten per cent. It is surprising, in view of the deep and far reaching effects of the depression, that the number of ports in 1936 was only one fewer than in 1926.

AN ANALYSIS OF THE GROSS TONNAGE RANK

Changes in Status

In spite of the apparent stability, the ranking of ports according to their percentage of the gross national tonnage reveals significant changes (Fig.9, Table V). Three distinct groups of ports—major, secondary and minor—may be recognised in the rankings for 1926-36 and also for 1950-61. For strict comparability the division between the classes is maintained throughout the study at five per cent of the gross tonnage between major and secondary and one per cent between secondary and minor. Within the framework for 1926-36, only two ports moved from one class to another, but several ports changed their rankings within the classes.

In 1926 Wellington, Auckland, Lyttelton, Westport and Otago may be classed as major ports as they each handled over five per cent of the gross
tonnage. Collectively they dominated the Dominion's trade, handling almost three quarters of the gross tonnage. The two leading ports recorded marked gains between 1926-36, but Auckland's increase was greater than Wellington's. It resulted in Auckland displacing Wellington as the principal port.

Lyttelton, the third ranking port, retained its position with a slight increase in the port's share of the gross trade. Westport, however, failed to maintain its major status as its share fell below the qualifying condition of five per cent in 1936. It was, therefore, reclassified as a secondary port. Although Otago moved up from fourth to fifth position on the gross tonnage scale, it did not increase its share of the overseas trade. The drastic loss at Westport, therefore, resulted in the aggregate trade of the major ports declining to less than 61 per cent. Thus, the four ports with major rankings in 1936 were those serving the metropolitan centres.

There were nine secondary ports in 1926, ranging from Greymouth at the upper end of the scale to Gisborne at the lower extreme. None of the ports within the group were reclassified in 1936, although the addition of Westport and Picton, the former minor port, increased the number of secondary ports to eleven. The striking feature was the fact that the only ports to move up on the scale were Bluff (from twelfth to tenth) and Nelson (from thirteenth place to ninth). All the other ports, except New Plymouth, lost ground, relatively, compared with their position in 1926. The ports to fall in the rankings were Wanganui (from ninth to eleventh), Timaru (from eleventh to twelfth) and Whangarei (from tenth to thirteenth) respectively. The net result of the changes was for the share of the secondary ports to be increased from over 25 per cent in 1926 to over 30 per cent in 1936.

Some sharp changes in rank occurred within the minor ports, but such fluctuations were common as the margins separating one port from another were relatively small. As only Picton moved from minor to secondary status, the most impressive changes were the decline of Thames (from fifteenth to twenty-sixth) and Tauranga (from eighteenth to twenty-second place). Indeed, the general trend among the minor ports was for them to decline, in relative of the national total importance, to less than two per cent. Thus, in spite of the apparent stability, there were several changes in rank between 1926-36.
Changes in Concentration

Changes in concentration, implicit in the variations of a port's position on the gross tonnage scales for 1926 and 1936, are made explicit by calculating the difference between the actual tonnage of a port in 1936 with hypothetical figures showing what the level would have been if the ports had grown at the national rate between 1926-36 (Table V). The resulting positive and negative variations reveal (Fig.10) that there was increased centralization of activity between 1926-36 on three of the four ports serving the metropolitan areas. Indeed, Auckland and, to a lesser extent, Wellington and Lyttelton recorded marked gains. Apart from the losses at Westport and Greymouth, the gains were made largely at the expense of the North Island ports of Whangarei, Thames, Tauranga, Napier and Wanganui. There were, however, deviations from the pattern of increased centralization on the ports serving the metropolitan areas at the expense of the outlying ports, as both Nelson and Bluff recorded significant gains.

In attempting to account for the variations, the gross tonnage is broken down successively into its three constituent elements of overseas, coastal and transhipment trade. Each of the elements is examined separately by analysing the changes in the rank of ports on the overseas, coastal and transhipment scale. The results of the analyses are then drawn together to account for the changes in the gross tonnage rank of ports.

IIIO OVERSEAS TONNAGE

In 1926 there were 22 ports engaged in the overseas trade. Their aggregate tonnage was 3.1m. tons, which accounted for over one third of New Zealand's gross tonnage. It was well maintained to 1930, but the depression resulted in a sharp decline (Table VI). The lowest point reached was 2.3m. tons, in 1931. Although the ports numbered one less in 1936, compared with 1926, an improvement in the economic conditions resulted in a rise in tonnage to 3.3m. tons - an increase of six per cent. As the overseas trade had recovered more quickly than the coastal trade, it was responsible for over two fifths of the gross tonnage handled in 1936.

Changes in Status

When the ports are arranged according to their share of the total overseas tonnage (Fig.11, Table VII), it is apparent that the increase in
the external trade produced few changes in the status of ports. There was only one change of class within the framework provided by grading ports with over five per cent of the overseas trade A, under five and over one per cent B and less than one per cent C. However, there were some marked variations within classes.

In both years the grade A ports - those with over five per cent of the overseas trade - were, in order of importance, Auckland, Wellington, Lyttelton and Otago. Although there were no changes in rank within the class, Auckland and Wellington consolidated their position. Together, the two North Island ports amassed three times more cargo than their southern rivals, Lyttelton and Otago. Indeed, Lyttelton, the third ranking port, fell further behind, with a decline in its relative share of the overseas trade between 1926-36. Otago was, therefore, able to narrow the gap between the third and fourth ports, with a small increase in its proportionate share. Yet, in spite of the poor showing of the South Island ports, the grade A ports collectively emphasised their dominance of the overseas trade by increasing their aggregate share from nearly 78 per cent of the national total in 1926 to almost 83 per cent in 1936. In view of their overwhelming dominance of the overseas trade, it is traditional to designate the four grade A ports as the "main ports".

Whereas the rankings of the grade A ports remained constant between 1926-36, there were changes among the grade B ports, handling between one and five per cent of the total trade. Indeed, only New Plymouth maintained its proportionate share of the overseas trade. All of the other ports recorded losses and these resulted in Timaru falling in the rankings and Westport being reclassified as a grade C port, as it failed to reach the grade B qualifying standard of one per cent. As a result of the changes, Greymouth and Wanganui improved on their 1926 positions. The share of the grade B ports declined from almost 16 per cent in 1926 to less than 12 per cent in 1936.

There were, in contrast to grades A and B, several sharp changes in rank among grade C ports handling less than one per cent of the overseas trade. Such fluctuations in rank were common and of less importance than those in the first two classes as margins between individual ports were small. In spite of the addition of the former grade B port, the importance of the grade C ports dwindled even further as their aggregate share of the overseas trade declined.
from over five per cent in 1926 to four per cent in 1936. Apart from the fluctuations among the grade C ports, the general impression of the overseas trade is one of relative stability.

Changes in Concentration

When the changes in concentration are made explicit by translating them into absolute terms (Fig.12, Table VII), it is clear that there had been increased centralization on Auckland and Wellington, which were the only ports to record large gains. The gains were made at the expense of Hokianga and Napier in the North Island and Westport, Greymouth, Lyttelton and Timaru in the South Island. Although the comparative changes at the other ports varied in sign, they were small in magnitude. The changes, therefore, were confined to a limited number of ports.

In interpreting the comparative changes in the overseas trade, the individual totals must be divided into the component elements of imports and exports. Industrial raw materials and manufactured goods make up the bulk of the imports, while pastoral produce provides most of the exports. As the two components varied so much in type and character, they are examined separately.

Imports

The number of ports handling imports declined from 19 in 1926 to 17 in 1936. Yet, the tonnage handled remained almost identical. In 1926 2,31m. tons were imported compared with 2,30 tons in 1936. The small decrease, however, resulted in a decline in the proportionate share of imports, from 78 per cent of the overseas trade in 1926 to 72 per cent in 1936.

Changes in Concentration

When the changes in imports are revealed (Fig.13 Table VIII), it is apparent that there had been increased centralization of trade on Auckland and Wellington. The marked gains at the two leading ports were made at the expense of a wide range of modest losses, ranging from Napier and New Plymouth in the North Island to Lyttelton, Timaru and Bluff in the South Island. As the changes at the other ports were small, they did little to account for the changes in the overseas trade.

Explanatory Variables

The factors that may be related to the variations in the import tonnage of individual ports are:
(i) changes in the population of the inferred hinterlands of the respective ports.

(ii) the growing trend towards centralization of the economic life of the country on Auckland and Wellington.

(iii) changes in a select group of commodities.

The method of analysis is to examine each of the factors in turn, to assess its contribution to the changes in imports.

(i) Changes in population: As imports were destined for consumption in New Zealand, it would be expected, on hypothetical grounds, that changes in the import tonnage would be related to changes in the population of a port's hinterland. For the purposes of testing the association, the hinterlands were defined (Fig. 14) on the basis that a given port should attract to itself all imports destined for consumption by the population within an area in which it enjoyed a railway freight rate advantage in Class C (general goods) over other ports. The association of the population of the inferred hinterland and import tonnage received by individual ports shows the high correlation coefficient of $r = +.97$ for each of the selected years. In view of the close relationship, it would be expected that changes in the population of the inferred hinterland between 1926 and 1936 would account for changes in the amount of imports over the same period. The assumption was tested by plotting the changes in imports against the variations in population on a scatter diagram (Fig. 15). It revealed that there was no simple, direct relationship between the two variables. Apart from Auckland and Wellington - which experienced large increases in imports and population - there was a trend for the import tonnage to decrease with the increase in population. It was signi-

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1. Imports for re-export only amounted to 0.30 per cent of the total import tonnage in 1926 and 0.18 per cent in 1936.
2. Equal per capita rates of consumption are assumed for New Zealand. Ideally some allowance should have been made for the lower levels of consumption among the Maoris.
3. Where rail transport was not available, accessibility and proximity to other ports were taken into consideration in defining the respective hinterlands of New Zealand ports in 1926 and 1936.
4. The use of the inferred hinterland appeared a more meaningful concept than the population of the "port-city". In both 1926 and 1936 the association of the population of the port-city and imports give a correlation coefficient of $r = +.94$.
5. As the result might be biased by the inclusion of imports not oriented towards population, such as artificial fertilisers, changes in general cargo imports were plotted against the variations in the population of the inferred hinterland. However, the same pattern was so similar to that of the total imports that there was little point in pursuing the inquiry.
significant that both Otago and Wanganui had absolute increases in import tonnage, but their hinterlands lost population. Lyttelton's tonnage, in contrast, decreased, but the population of the hinterland increased. It is possible, however, that a threshold population has to be reached before imports and population increase simultaneously. From evidence of the two selected years, the threshold population necessary for imports to increase with population would have been between 20,000 and 50,000. Unfortunately the number of observations is too small to make a valid generalisation. However, the difference between Auckland and Wellington and the remaining ports was so marked that a second premise was formulated to account for the phenomenon.

(ii) Centralization of the economic life of the country:—It is suggested that the centralization of the economic life of the country on the two North Island metropolitan centres would account for the increase in imports at Wellington and Auckland, at the expense of other ports. The tendency towards agglomeration is principally the result of two forces. In the first place, it is clear that the constant improvement of communications has had a powerful centralizing effect upon economic activities in New Zealand. The same trend results from the operation of market forces. "If things were left to market forces unhindered by any policy interferences, industrial production, commerce, banking, insurance, shipping, and, indeed, almost all those economic activities which in a developing country tend to give a bigger than average return .... would cluster in certain localities." If the centralization of imports was taking place, it would be expected, over the period 1926 to 1936, that Auckland and Wellington would have increased their tonnage at the expense of ports within their respective spheres of influence. For the purpose of testing the assumption, the definition of the two fields of interest was based on an examination of New Zealand's internal transport

6 Otago's loss in population was obscured by the influx of visitors to the South Seas Exhibition which was in progress during the Census of 1926. It resulted in Dunedin's population being boosted by 5,000. See 'Increase and Location of Population', N.Z. Population Census, Vol. 1. 1936, pp.iii-v.

7 It would be valuable for predictive purposes to obtain comparative evidence from other countries to see if such a threshold exists.

network (Fig.14). Ports which had more frequent connections by land or sea were allocated to the northern sphere, which covered the northern part of the North Island. Similarly, ports linked to Wellington were assigned to a southern sphere, which embraced the southern part of the North Island and the whole of the South Island. As both ports had strong influences in Napier and New Plymouth, the boundary was drawn through the ports. Their imports were shared equally between the northern and southern spheres of influence.

The assumption of increasing centralization was tested by plotting for each year, from 1926 to 1936 inclusive, Auckland's percentage of the imports in the northern sphere and Wellington's percentage of the imports in the southern sphere (Fig.16). It reveals that both ports increased their respective shares of the total import tonnage, compared with the "influenced" ports. In 1926 Auckland was already the dominant port in the northern sphere. The port consolidated its position by increasing its share of the import tonnage from 90.3 per cent of the northern sphere's total in 1926 to 94.8 per cent in 1936 (Fig.16A). In contrast to Auckland, Wellington was in a much weaker position in the southern sphere. The port had to face competition from the grade A ports of Lyttelton and Otago, to distribute imports in the South Island. In 1926 Wellington had only 46.8 per cent of the import tonnage of the southern sphere (Fig.16B). In spite of increased competition for the diminished volume of trade, the port's share of the southern sphere's trade rose to 52.7 per cent in 1936. There is no evidence, however, that the port improved its position at the expense of Otago and Lyttelton. By plotting the respective tonnages of Otago and Lyttelton against Wellington, it is evident that as Wellington increased its tonnage so did Otago (Fig.16C) and Lyttelton (Fig.16D). Conversely when Wellington's import tonnage declined, it was matched by a parallel loss in tonnage by the two South Island ports. Wellington's gain in imports, therefore, was at the expense of the secondary and minor ports in the southern sphere. Thus, the result supports the premise that changes in imports are associated with the trend for the economic life of New Zealand to be concentrated on Auckland and Wellington. The trend towards centralization does not, however, fully account for all of the changes in imports.

(iii) Changes in a select group of commodities: In an attempt to account for the unexplained variations in import tonnage, a third premise is
formulated, that variations are associated with changes in a select group of commodities. The imports for 1926 and 1936 are confined to eight commodity groups (Table IX). By excluding sugar, exclusively handled by Auckland, and "other goods" from consideration, six commodities remain. When their respective volumes are compared for 1926 and 1936, three of them, petroleum products, artificial manures and "general goods", increased in importance and three others, coal, hardwoods and softwoods, declined. A subtraction of the commodities which increased in importance (Group A) from those which declined (Group B) provides a measure of the change in tonnage between the two groups in the selected years. The formula for the group change can be written as follows:

\[(1936 \text{ Group A} - 1926 \text{ Group A}) - (1926 \text{ Group B} - 1936 \text{ Group B})\]

If a port offset the decline in Group B commodities by Group A commodities, a positive tonnage is shown. However, if the increase in Group A commodities failed to match the decline in Group B commodities, a negative tonnage is indicated. In view of the dominance of the commodities forming Groups A and B in the import tonnage, a significant relationship would be expected for individual ports between the group change and variations in imports. The assumption was tested by plotting the group change against changes in import tonnage. As expected, there was a close relationship between the two variables (Fig. 17). Generally, the ports that showed a positive group change had a commensurate increase in imports between 1926 and 1936, whereas the ports with a negative group change lost a similar amount of import tonnage.

Changes in imports were, therefore, closely associated with variations in the distribution of the two groups of commodities. Apart from Westport and Greymouth serving the coal producing area of the west coast of the South Island, Group B commodities - coal, hardwoods and softwoods - were common to all importing ports. The decline of Group B commodities, therefore, affected nearly all ports. Their decline can be attributed, first, to the fall off in the number of construction projects requiring hardwoods and softwoods as building materials, and secondly to the substitution of imported Australian coal by local varieties and by the use of alternative fuels, particularly

10 The better use of low grade coals permitted the displacement of the higher calorific coals from Australia.
hydro-electricity and oil-fuel. All ports, in contrast, did not benefit from
the growth of the Group A commodities - general cargo, artificial manures and
petroleum products. Their increase was concentrated on a narrow range of
ports. Only the ports with bulk oil terminals or fertiliser works were able
to take advantage of the rise in the imports of petroleum products and artificial
manures. Increases in general goods were confined to a limited number of
ports as there was a trend for general goods to be concentrated on the grade
A ports between 1926-36. Thus, the changes in the select group of commodities
provided a close approximation of the variations in imports. The closest
relationship occurred at ports with a limited range of commodities, such as
Gisborne and Oamaru (Fig.17). However, the group change did not fully account
for all of the changes, as abnormal differences in the import of single commod-
ities resulted in marked differences from the expected pattern.

Lyttelton's group change overestimated the port's loss (Fig.17). The
anomaly was due to Lyttelton's slow recovery from the depression. It lagged
behind the other ports, and in 1936 - the year chosen for analysis - it had not
fully completed its recovery. General cargo imports were only slightly above
the 1926 level, and artificial manures failed to reach their former level. As
only petroleum products had shown an absolute increase among the Group A
commodities, the rise was insufficient to offset the decline in Group B
commodities.

Auckland's group change, in contrast to Lyttelton's, overestimated the
port's gain in imports (Fig.17). The anomaly was due primarily to a change in
government policy. Imports of wheat and flour were subject to rigid control
in 1936, to stimulate the local cultivation and processing of these commodi-
At Wellington, also, the decline in the import of wheat and flour was largely

11 As the criterion of a port's status emphasises bulk commodities, the
opening of a fertiliser works can have an important effect. For example, the
increase in tonnage at Wanganui was largely accounted for by the fertiliser works
opened in 1926, coming into full production. Similarly, at Otago the opening
of the second fertiliser works at Ravensbourne in 1930 was responsible for
boosting the ports imports by several thousand tons.

12 There is evidence of a differential response to the depression among
various New Zealand areas. Unfortunately no detailed account of the regional
impact of the economic depression is available to substantiate the findings.

13 Lyttelton was the only main importer of artificial manures to suffer a
decline in fertiliser imports. With the upsurge in wheat cultivation during
the depression, farmers on the light soils of the plains tended to cut back on
fertiliser compared with the dairying lands of the North Island. The "light land revolution" beginning in the late thirties, brought about a marked increase
in the application of fertiliser. In 1937 the import of fertiliser increased
by 36 per cent to 35,000 tons compared with 1936.
responsible for the group change overestimating the actual increase\(^1\) (Fig.17). The other main deviations were at Timaru, Napier and Bluff. This was due to the changeover from packaged to bulk handling of petroleum products.\(^2\) In 1926 all three ports handled large quantities of packaged oil products, but with the introduction of oil tankers to New Zealand in 1926 they were deprived of the trade, as oil products were concentrated on ports with ocean terminals.\(^3\) Thus, from the analysis of the main deviations and the group change it is apparent that many of the detailed variations in imports were inherent in the type and character of the main commodities.

As the changes in the select group of commodities were so closely interrelated to the other premises examined in the foregoing analysis, no statistical experiment was undertaken to ascertain which variable contributed most to the "explanation" of changes in import tonnage. The analysis suggests, however, that the variations in imports were directly related to changes in a select group of commodities and the trend towards the centralization of the economic life of the country on the two main centres. There is, also, tenuous evidence that a threshold population has to be reached before imports increase simultaneously with a rise in population. However, there is little support for the premise that changes in imports were directly related to changes in population.

**EXPORTS**

Exports were more widely dispersed than imports. They were handled by 22 ports in 1926, compared with two fewer in 1936. In spite of the reduction in the number of ports, exports increased in tonnage from slightly over 750,000 tons in 1926 to just over 1m. tons in 1936. Their percentage share of the overseas trade, compared with imports, increased from 22 per cent in 1926 to 28 per cent in 1936.

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\(^1\) As there were no fertiliser works at Wellington, the increase was primarily due to a rise in general cargo and petroleum imports.

\(^2\) Prior to bulk handling all motor spirit and ancillary products were imported in case lots.

\(^3\) Ocean terminals were built at Auckland, Wellington, Lyttelton and Otago in 1926. The terminal at New Plymouth was not opened until 1927. In 1936 the New Plymouth terminal was small in comparison with other ports and handled less than it imported in case lots in 1926.
Changes in Concentration

When the comparative changes are revealed (Fig.18, Table X), the outstanding feature is the increased centralization of exports on Auckland and, to a lesser extent, on Wellington. However, the changes did not parallel imports, as New Plymouth and Bluff also recorded small gains. Apart from the losses at Hokianga and Wanganui, the main negative results were at the South Island ports of Westport, Greymouth, Lyttelton, Timaru and Otago. Although the changes in exports at the remaining ports varied in sign, they were small in magnitude. Thus, the changes were confined to a limited number of ports.

Explanatory Variables

The variations in exports at individual ports are presumed to be associated with:

(i) changes in the pastoral group of commodities.
(ii) the trend towards centralization on the “main ports”.

Each of the factors is examined to assess its contribution to the changes in exports of individual ports.

(i) Changes in pastoral commodities:— The first premise is that changes in exports are related to variations in the pastoral group of commodities. It is based on the predominance of pastoral commodities in the export tonnage. Indeed, the dominance of the pastoral commodities was increased with the expansion in their aggregate tonnage from almost 460,000 tons in 1926 (or 61 per cent of the total exports) to nearly 716,000 tons (or 72 per cent) in 1936. The increase resulted from farmers producing more through intensified farm management methods, to offset the fall in prices during the depression. In view of the increased importance of pastoral commodities, it would be expected that the variations in exports at individual ports would be closely related to the change.

In making the assumption, three specialised ports—Greymouth, Westport and Kaipara—were omitted from consideration. They differed from the other ports in that they concentrated entirely on the export of coal and timber.

17 The "pastoral commodities" are frozen meat, preserved meat, wool, butter and cheese, milk products, hides, tallow and skins.

18 The methods involved the use of fertiliser as top dressing, the subdivision of paddocks, conservation of surplus grass in the form of hay and ensilage and the further development of livestock management.
All three ports had declined in importance with the fall off in the demand for their exports. The decline at Westport and Greymouth was primarily the result of the substitution of oil fuel for coal in ships' bunkers. On the other hand, Kaipara's decline was due to the decrease in timber exports to Australia, with the exhaustion of the native kauri stands.

Omitting the three specialised ports, the assumption that the changes in exports between 1926-36 are related to variations in pastoral commodities is tested by plotting the two variables on a scatter diagram (Fig.19). As there appears to be a close relationship between the variables, a fuller interpretation of the export changes can be obtained from an explanation of the variations in the tonnage of pastoral commodities.

However, there is one striking anomaly in the general pattern, before the explanation is attempted (Fig.19). Wellington's marked increase was underestimated by the change in pastoral commodities. The deviation can be attributed to the port's function as the Dominion's major fuelling centre for overseas ships. The intake of fuel by overseas ships is recorded as an export.

Apart from this anomaly, it is assumed that the variations in the export of pastoral produce are related to different rates of development within the hinterlands of the respective ports. The assumption is examined by using the same hinterlands as those established for imports (Fig.14), on the basis that a given centre should attract to itself all the commodities destined for export from the area in which it enjoyed a railway freight rate advantage. A measure of the change in pastoral development within the hinterland is provided by the difference between livestock units within the defined areas for 1926 and 1936.\(^{19}\) The changes in livestock units are plotted against the changes in the tonnage of pastoral commodities for each port (Fig.20), to see if there

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\(^{19}\) For this calculation a cow in milk is regarded as being one unit and other classes of stock are evaluated on the basis of estimated food consumption. viz: 1 cow in milk = 1 unit  
= 6 breeding ewes  
= 8 dry sheep  
= 1½ beef breeding cows  
= 2 all other cattle

Strict accuracy is not claimed for the method as there is a wide divergence in food consumption between the same breed of stock in different localities and between different breeds of stock. See White, J.V.: Livestock Farming in the North Island: a Study in Production, Trends and Potential, N.Z. Department of Agriculture Paper No. 19, Wellington, 1954.
is a relationship between the variables. However, in drawing conclusions from the scatter diagram, Auckland has to be omitted from consideration. The tremendous increase in pastoral exports and livestock units in the port's hinterland - largely due to the expansion of dairy farming in the Waikato - outstripped other centres and made the port unrepresentative of the total universe. From the remaining observations, it appeared that there was a rise in exports if the increase in livestock exceeded 20,000 units. For each increase of 4,000 livestock units above that figure, the export tonnage should increase by 1,000 tons.

The anomalies from the expected pattern can be attributed, first, to special factors of distribution and secondly to the crude and insensitive criterion for measuring change. It is difficult to make allowance for special distribution patterns as there is no indication of the origin of exports in the statistics. However, it was an established practice for exports from the hinterland of one port to be exported from another, particularly if the port could offer a better shipping service. Butter from Wanganui's hinterland was exported from Wellington\(^{20}\) and frozen meat from Timaru was shipped from Lyttelton.\(^{21}\) Anomalies also resulted from the use of livestock statistics. They did not, in themselves, give a true guide to production trends, because of the increase in productivity per animal. As it applied particularly to dairy cows, it could account possibly for the anomaly at New Plymouth where there was a small increase in livestock units but a large increase in pastoral production (Fig. 20). Broadly, therefore, changes in the tonnage of pastoral commodities are associated with changes in the livestock numbers in their respective hinterlands, although in each individual case due consideration must be given to the special distributional patterns and the accuracy of the respective criteria.

(ii) Centralization of exports: It is suggested that the changes in exports are associated with the attempt to centralize trade on the "main ports" of Auckland, Wellington, Lyttelton and Otago. The main aim of centralization was to make fuller use of the extensive installations of the larger ports.


\(^{21}\) There were innumerable protests from the Timaru Harbour Board between 1926-36 of meat from local works being shipped from Lyttelton. See Timaru Harbour Board, Annual Reports, Timaru, 1926-36.
Imports were spread evenly throughout the year, but exports were seasonal. As the major ports already handled nine tenths of the imports, they concentrated their efforts on capturing export trade from the grade B ports. Throughout the inter-war period there was strong criticism of the practice of overseas ships calling at a large number of secondary and minor ports, to load refrigerated cargo. Disparagingly referred to as "call at your farm policy", the main ports sought to undermine it by abolishing the "flat rate system". Regardless of a port's facilities and the cost of loading, the flat rate for all pastoral produce from New Zealand to the United Kingdom, negotiated by the Export Boards, was the same for all produce and at all scheduled ports. The Wellington Harbour Board, the main protagonist for abolishing the system, stated categorically as a body:

"That in the opinion of the Board the present system of the flat rate of freight for all ports in the Dominion is wrong in principle and is most unjust to all users of the main ports providing safe accommodation and modern facilities for handling ships and cargo; that it retains ships on the coast for a much longer period than is absolutely necessary; that it prevents quick and regular shipments of our produce and is generally against the interests of the Dominion."\(^{24}\)

Penal rates were suggested for the "open (roadstead) ports" without facilities, at which working of the ship and cargo was slow, dangerous and often costly. By concentrating the ships at the major ports, an estimated savings of 30-50 days in the turn-round of ships was envisaged. This policy of the main ports, "to injure and discredit the secondary ports", was claimed to be unnatural, "as New Zealand is a country which is divided by mountain ranges into separate commercial zones, which drain their commerce into the most convenient port. Attempts to disrupt the system could only lead to the congestion of the main ports and an additional financial burden to the districts concerned in transhipping cargo by sea or rail."\(^{25}\)

If the prevailing policy had affected the export tonnage, the grade A ports would have gained at the expense of grades B and C ports. As it was

\(^{22}\) These were producer organisations constituted to rationalise the marketing of primary produce under the Meat-export Control Act of 1922 and the Dairy produce Export Control Act of 1923.

\(^{23}\) The export of dairy produce and meat was confined to ports nominated by the controlling bodies.


\(^{25}\) Veitch, W.A. in New Zealand Parliamentary Debates, Vol.209. 1928, p.44.
undesirable and costly to transport relatively low value-high bulk frozen produce long distances, only the ports connected by rail or short sea distances could have been influenced by the grade A ports. Each of the grade A ports is, therefore, examined in turn to see if it extends its influence at the expense of the grade B and C ports within its sphere between 1926-36. This is done by comparing the results obtained from applying the following formula to each year between 1926-36.

\[
x \times \frac{100}{x + y_1 + y_2 + \cdots + y_n}
\]

where

- \(x\) is the annual export tonnage of the grade A port.
- \(y_1 \ldots y_n\) are the annual export tonnages of the "influenced" ports.

The results are presented on Figure 21. Each of the four grade A ports is examined in turn.

Auckland had little to gain from centralization. Apart from exports of produce from Russell, the port already monopolised the trade of the northern part of New Zealand (Fig. 21A). On the other hand, Wellington could have benefitted from such a policy, by attracting cargo from Napier, Wanganui, New Plymouth, Picton and Nelson. Wellington's index of centralization revealed that there was a trend towards concentration of exports on the port. (Fig. 21B). It was not, however, at the expense of all ports. By obtaining individual indices between pairs of ports, it can be seen that Wellington gained at the expense of Wanganui, but not at the expense of New Plymouth and Napier (Fig. 21C). The difference could possibly be attributed to the respective rail distances of the three ports from Wellington, Wanganui being only 112 miles, whereas New Plymouth and Napier were over 210 miles. The latter ports, therefore, were afforded some protection, by distance, from the incursion of Wellington. Distance, however, did not protect Timaru from Lyttelton, as there were only 100 miles between the ports. Indeed, Lyttelton's share of their combined trade rose from 71 per cent in 1926 to 76 per cent in 1936 (Fig. 21D). Otago, the fourth grade A port, was, however, less successful. The port had only slightly improved its position over the period 1926-36 compared with its main rivals, Oamaru and Bluff (Fig. 21E). From the analysis, there does appear to be some evidence of an increasing concentration of exports at Wellington and Lyttelton, but not at Auckland and Otago.
As the two premises put forward to explain the changes in export tonnage were closely related, and did not apply to all ports, no statistical experiment was undertaken to obtain their respective contributions to the total "explanation" of the variations. The analysis does, however, reveal a simple, direct relationship between variations in exports and changes in pastoral commodities. There was, also, some supporting evidence that the practice of centralization had reacted in favour of Wellington and Lyttelton. However, ports outside a 120 mile radius of the main ports showed strong growth and were apparently unaffected by the practice.

Imports and exports, therefore, reacted to different stimuli. Yet the effect of the changes in both components was broadly similar in that it intensified the concentration of overseas cargo on the two leading ports of Auckland and Wellington. The changes also weakened the extreme imbalances of flow exhibited by seaports in the overseas trade (Table XI). Indeed, the number of ports with over 80 per cent in one direction was reduced from over one half of the ports handling overseas trade in 1926 to one third in 1936. However, in spite of a slightly more balanced trade, the grade A ports, Auckland, Wellington, Lyttelton and Otago remained, without exception, strong on imports. The grade B ports - apart from the specialist coal and timber exporting ports of Westport (re-classified as grade C in 1936) and Greymouth - had a more balanced flow in both years. With the decline of coal imports and changes in the pattern of distributing petroleum products, the balance of flow moved from an emphasis on imports in 1926 to a preponderance of exports in 1936. The grade C ports, except for Oamaru and Nelson, still retained their extreme imbalance, as in both 1926 and 1936 almost all of their trade was in one direction. Thus, the increased centralization had not achieved the desirable condition of balance between inbound and outbound movements so that full economic use could be made of the transportation facilities, both of land and water, which serve the ports.

IIC COASTAL Tonnage

The coastal trade was the most important constituent of all tonnage handled by New Zealand ports in 1926 and 1936. Coastal cargoes of almost 4.1m. tons in 1926 accounted for over half of the gross tonnage. The annual trade was maintained at over four million tons until 1930 (Table XII). Then
followed a sharp decline in tonnage during the depression. The lowest point of 2.8m. tons was reached in 1933. A speedy recovery ensued with the general improvement in economic conditions. By 1936 the trade had reached almost 3.7m. tons, but it was still eight per cent below the 1926 total. As the overseas trade recovered more quickly from the depression, the coastal trade's share of the gross tonnage declined slightly to under 49 per cent. Despite the wide fluctuations in the volume of cargo handled over the period, the number of ports engaged in the coastal trade remained constant. There were 46 ports handling coastal cargo in 1936, only one fewer than the number in 1926. Indeed, the persistence of ports in the New Zealand commodity flow pattern was most striking, after a period of rapid economic change and upheaval.

Changes in Status

The stability is also apparent when the ports are ranked according to their percentage share of the total coastal trade in 1926 and 1936 and grouped into three grades A, B and C, as only two ports changed classes (Fig.22, Table XIII). There were, however, sharp changes within the classes, which did not produce a change in status.

Five ports, Auckland, Wellington, Westport, Lyttelton and Greymouth, each handling over five per cent of the coastal trade, may be classed as grade A ports in both of the selected years. Within the class there were sharp variations between ports ranging from an impressive gain at Wellington, a modest gain at Lyttelton, slight losses at Auckland and Greymouth and a heavy loss at Westport. The cumulative effect on the group's share was not great, as in both years the grade A ports collectively handled over two thirds of the coastal trade.

The share of the grade B ports - handling collectively between one and five per cent - was also maintained at over one quarter of the total trade in 1926 and 1936. Yet, there was a reduction in the number of ports, from 13 in 1926 to 11 in 1936, with the re-classification of Thames and Tauranga as grade C ports. In spite of relative losses, Otago and Whangarei retained their positions at the upper end of the range of grade B ports. There were, however, sharp variations at the extreme end of the range. The South Island ports had fared better than the North Island ports, as Nelson, Picton, Timaru and Bluff all improved on their rankings. Apart from Onehunga, the North Island ports of
New Plymouth, Wanganui, Napier and Gisborne all recorded losses. Thus, there was a differential change between grade B ports located in the North and South Islands.

The differential change was not reflected among the 30 grade C ports, which individually handled less than one per cent of the coastal trade. Augmented by the two former grade B ports of Thames and Tauranga, the share of the grade C ports increased slightly between 1926-36, but they still handled less than one tenth of the coastal trade. There were many changes of rank among the grade C ports, but they are only to be expected as the margins separating individual ports were small. The most noteworthy changes in the rankings were the decline of Oamaru and the rise of Picton, Whakatane and Motueka. But none of the ports increased sufficiently to be re-classified as a grade B port.

Changes in Concentration

When the changes in concentration implicit in the rankings are expressed in absolute terms (Fig.23, Table XIII), the overriding impression of stability is confirmed. Most of the positive and negative variations do not exceed 10,000 tons. The marked changes are, therefore, confined to a narrow range of ports. There was a phenomenal gain at Wellington and substantial increases at Nelson and Lyttelton, but the other marked positive values at Whakatane, Patea, Picton, Timaru and Bluff were modest. Negative values were more numerous than positive ones, but the striking changes were limited to a drastic loss at Westport, a heavy decline at Thames and moderate decreases at Whangarei, Auckland, Tauranga, Gisborne, Wanganui, Otago and Invercargill. There appears to be a chaotic absence of pattern in the changes, as the variations bear little relationship to the ranking of ports on the coastal tonnage scale.

The Pattern of Analysis

In an attempt to discover a pattern in the comparative changes of ports, the coastal trade is divided into its component elements of shipments and receipts. The basis for the distinction is one of convenience, as the commodity differences recognised between imports and exports in the overseas trade do not occur between receipts and shipments in the coastal trade. Indeed, the outbound cargo at one port is the inbound cargo at another. As
the commodities involved are the same, it is presumed that the changes in receipts and shipments at individual ports would be associated with certain general factors which influence the main generators of commodity movements in New Zealand. The expression of the factors is not uniform and clearly varies between different regions recognised on Figure 24. As there also appear to be localised regional influences affecting ports, the changes are examined according to each of the eight regions. A distinction is made to facilitate the analysis between three different types of coastal trade. They are:

(i) the intra regional trade, involving commodities originating and terminating at ports solely within the same region.

(ii) the intra island trade, involving commodities originating in one region and terminating in another region within the same island.

(iii) the inter island trade, involving commodities originating in one island and terminating in the other island.

An Examination of Shipments and Receipts

Between 1926-36 the changes in shipments and receipts differed widely between individual ports. The twin components of the coastal trade are, therefore, examined separately by identifying the ports with the largest comparative gains and losses.

SHIPMENTS

As with the total coastal trade, it is difficult to detect a pattern when the changes in shipments are translated into absolute terms (Fig. 25 Table XIV). However, by examining the map inset, and regional tabulations, a more coherent pattern emerges (Fig. 25, Table XV). The substantial gains in the West Coast (N.I.) region and the East Coast (S.I.) region are revealed and the heavy loss in the West Coast (S.I.) region confirmed. From the main portion of the map it is apparent that the positive or negative results are derived from changes at a limited number of ports (Fig. 25). Thus, in the Auckland region, the modest gain at Auckland and the losses at Whangarei and Thames virtually accounted for the net loss. There were, however, no outstanding changes in the uniformly positive behaviour of Poverty Bay, but Napier

26 The regions were delimited for this study on the basis of the location of economic activities and the railway network in 1926 and 1936. Their boundaries were drawn specifically to cover particularized production areas and to reduce inter-regional connections by rail to a minimum.
contributed most to the Hawke's Bay region's loss. The substantial gain in the West Coast region was derived from Wellington's increase as the trends at the other ports were small and mixed. In the South Island, the positive result in the Marlborough region was solely due to Picton's gain. Nelson dominated the Nelson region's positive showing, whereas Westport overwhelmingly contributed to the heavy loss of the West Coast region. The gain in the East Coast region was derived primarily from Lyttelton and, to a lesser extent, from Timaru. Apart from the Poverty Bay region, therefore, the changes in shipments were confined to a single or small group of ports within each region.

RECEIPTS

When the variations in the concentration of receipts are revealed by expressing the changes in absolute terms (Fig. 26 Table XVI) and compared with shipments, frequent sharp differences in sign, as well as magnitude, are revealed. By scrutinizing the map inset and the regional tabulations (Fig. 26, Table XVII), it is apparent that the changes are much smaller than the variations in shipments. The West Coast (N.I.) and Nelson again revealed impressive, but less substantial, gains. Auckland showed a loss, but it was less severe than in shipments. Trends were reversed in the East Coast (S.I.) region. In striking contrast to the drastic loss of shipments, however, the West Coast (S.I.) region exhibited only a small loss.

Although there were differences between the changes in receipts and shipments, the regional positive and negative characteristics were again contributed by a limited number of ports (Fig. 26). Thus, in the North Island, trends were more mixed in the Auckland region, but the gain at Whangarei and the sharp losses at Auckland and Tauranga accounted for the region's net loss. Mixed trends were evident in Poverty Bay but Gisborne was responsible for the region's loss. In the Hawke's Bay region there was no outstanding port, as all ports contributed to the negative result. The impressive gain at Wellington, compensating for the loss at Wanganui, was largely responsible for the West Coast region's substantial gain. In the South Island, there were no marked positive or negative changes in the Marlborough region and it had little impact on the national pattern. Nelson again dominated the increase in receipts in the Nelson region. There were no outstanding changes in the mixed trends in
the West Coast region, but the losses at Lyttelton and Otago were responsible for the net loss in the East Coast region. Thus, with the exception of the Hawke's Bay, Marlborough and West Coast (S.I.) regions, the changes in receipts were again confined to a limited number of ports.

**The General Factors**

As the outbound cargoes of one port are the inbound commodities of another port, the receipts and shipments of New Zealand ports must be subject to certain general factors which expand or contract commodity movements. Their main impact is on the persistent generators of the commodity flows in New Zealand. Six generators can be recognised between 1926-36. They are:

(A) the location of the main coalfield in the West Coast of the South Island.

(B) the location of the Dominion's principal grain growing areas in the East Coast of the South Island.

(C) the uneven distribution of population, heavily concentrated on the four main centres of Auckland, Wellington, Christchurch and Dunedin.

(D) the marked localisation of manufacturing in the four metropolitan areas of Auckland, Wellington, Christchurch and Dunedin.

(E) the location of the principal fruit growing area in Nelson.

(F) the policy of overseas shipping companies of concentrating imports and exports on larger ports.

The general factors affecting the generators of the commodity movements between 1926-36 were changes in:

(i) consumption

(ii) standard of living

(iii) government policy regarding overseas imports

(iv) manufacturing

(v) fuel technology

(vi) the significance of different methods of transport.

The six factors were interrelated, as they were affected directly or tangentially by the overriding influence of the economic depression of the thirties and the extension of government control into the fields of production, distribution and consumption. However, the general factors are examined more conveniently as separate items.

(i) **Changes in consumption:** Commodity movements were affected by changes in consumption which resulted from an 11.77 per cent increase in New Zealand's population, from 1.40 m. in 1926 to 1.57 m. in 1936.²⁷

²⁷ The population's percentage increase was the lowest ever recorded in New Zealand. It was due to a decline in the natural increase and a net migration increase. See *N.Z. Census, 1936*, 1, pp.iii-iv.
It was not, however, reflected in a general increase in tonnage handled by New Zealand ports, as commodity movements had been curtailed by the economic depression. As the rate of population growth varied between different areas, the changes in the number of consumers affected the diminished volume of commodity movements. As the North Island increased at a proportionately greater rate than the South Island, the difference between the two islands was accentuated. In spite of the depression, there were increased shipments of raw and processed agricultural products (flour, wheat, beans and peas, oatmeal and pollard and bran) from Marlborough, Nelson and the East Coast region in the South Island to all North Island regions. There was also an increased reciprocal flow of sugar and manufactured goods (imported and locally made), classed as "other goods", to meet the growing demand in the South Island. Thus, the selective impact of the changes in consumption clearly differentiated between the role of the South Island as a generator of agricultural products and the North Island as a growing producer of manufactured goods.

Commodity movements were also affected by differential sub-regional changes in population (Table XVIII). In certain instances there was a marked correlation between the pattern of consumption reflected in the regional receipts and the variations in population. The substantial increase in receipts at Wellington, for example, was associated with a marked rise in the sub-region's population, and conversely, the loss in receipts at Otago was related to a very small increase. Yet, the loss in receipts at Auckland was not associated with a small increase in population. Indeed, the largest gain in population was recorded in the region. This could, however, reflect increased self-sufficiency in the Auckland region, which lessened its dependence on other areas. It is more likely, however, that other factors were present, distorting the relationship between receipts and population. Thus, in contrast to the selective increases in certain commodities in the inter island trade, the impact of the differential changes in population growth were not always discernible in the patterns of consumption reflected in the regional receipts.

28 The growth rate for the North Island between 1926-36 was 12.88 per cent and 7.78 per cent for the South Island.
(ii) Changes in the standard of living: A fall in the standard of living, which resulted from the depression of the thirties, affected the character and the volume of commodity movements between 1926-36. As an exporter of primary produce, and with the largest per capita external trade of any country in the world, the depression affected New Zealand with great severity. The government responded to the economic conditions by reducing civil service salaries twice, abolishing compulsory arbitration to enable employers to make wage reductions, cutting widows’, war and old age pensions, diminishing staff, reducing public works loans by 75 per cent (while at the same time providing relief work for the unemployed) and eliminating non-essential imports. The depression was, mercifully, not prolonged. By 1936 there had been an upsurge in commodity movements, but they had not fully returned to their 1926 level.

Imported goods were quickly restored to their former level. The recovery of building activity, however, was not complete. Shipments of cement from Whangarei and Otago and receipts at other ports in 1936 were, therefore, smaller than in 1926. Basic foodstuffs, in contrast to building activities, were less affected by the depression. Although the consumption of certain commodities in 1936 was lower than in 1926, there was an increase in the movement of flour and cereals from the east coast ports of the South Island to the North Island and sugar from Auckland to ports in both islands. All commodities were not, however, affected by the depression. There was, for example, a substantial increase in shipments of fruit from Nelson for domestic consumption, with the general recognition of its value in the diet. Thus, although the rate of growth of the population is probably the basic factor underlying the long term movements in the flow of goods entering into consumption, the standard of living of the population as a whole is

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29 Almost 80,000 were unemployed at the height of the depression in 1933. See New Zealand Official Yearbook, 1937, p.707.

30 As the population of New Zealand increased by almost 12 per cent between 1926-36 a fall of 14 per cent in the volume of goods available resulted in a decline of 23 per cent in the volume of supply on a per capita basis. See New Zealand Official Yearbook, 1938, p.830.

31 In 1936 43 per cent of the total supply of goods were imported compared with 42 per cent in 1926. Ibid, p.831.

32 The per capita consumption of flour declined from 200 lb. in 1926 to 185 lb. in 1936, butter from 40 lb. to 35 lb., sugar from 121 lb. to 112 lb., tea from 7.8 lb. to 7.1 lb., beer from 9.2 gals. to 7.2 gals. and spirits from 0.47 gal. to 0.24 gal. Ibid, pp.833-42.

33 Ibid, p.838.
another factor of paramount importance in the ultimate analysis.

(iii) Changes in government policy regarding overseas imports:

Direct government intervention in the free flow of overseas imports also had repercussions on the coastal trade. Import restrictions were instituted in certain commodities to lessen the country's dependence on overseas trade. It is difficult to gauge the impact of government interference in the coastal trade as it is not always easy to distinguish between goods supplied by overseas countries and those produced in New Zealand. However, the effect of government intervention can be illustrated by reference to wheat imports. In 1926 37,946 tons were imported from Australia. The imposition of import restrictions resulted in the decline in wheat imports to 11,402 tons in 1936. Ports which had hitherto relied on imports - particularly Auckland and Wellington - were forced to increase the receipts of local grown varieties of wheat from Oamaru, Timaru and Lyttelton. Government interference, therefore, had a differential impact on the coastal trade.

(iv) Changes in manufacturing:

"It is considered that 1935-6 indicates the complete emergence of the factory industry of the Dominion from the depressed conditions." However, the character and volume of goods in the commodity movements were modified by radical alterations in the structure of New Zealand industry between 1926-36. Inefficient works, methods, firms and types of products were eliminated during the depression to enable industries to contend with the difficulties of reduced spending power, curtailment of government loans and intensified competition from lower priced imported goods. In particular, the rationalisation of the brewing industry had widespread repercussions on the shipments of beer from Dunedin and the receipts of other ports. Yet, it was not a period of contraction as new industries were developed and existing industries extended to provide new lines, because the depression changed tastes and made old lines unprofitable. The industries

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34 More rigid controls were imposed in December 1936.
35 Imports of wheat and wheaten flour were prohibited except under permits granted by Minister of Industries and Commerce by an Order in Council which came into force in March 1936.
36 Shipments of wheat from South Island ports increased from 23,063 tons in 1926 to 65,713 tons in 1936.
developed included motor assembly (first developed 1926), electric ranges (1931), gas meters (1930), petrol meter pumps, plastic mouldings (1932), radio sets (1930) and concrete roofing tiles (1935). This policy of expanding established industries and developing new industries was further encouraged by a change in thinking about the significance of secondary industries. It caused the Labour Party to make the protection and encouragement of secondary industry an important feature of its legislative programme when it was elected in 1935. The Industrial Efficiency Act (1936) was passed to encourage manufacturing. It was seen as a remedy for unemployment and as a means of rationalising an economy dependent to such a marked degree on the fluctuations of prices for primary products in a market 12,000 miles away.

The new developments, however, were not equally distributed throughout the country. As they were market oriented industries, they were located with respect to the distribution of population and the available methods of distribution. Most of the new industries, therefore, were located at Wellington, which was the focus of shipping services and the hub of business organisation in New Zealand or, to a lesser degree, at Auckland, which served the largest concentration of population. Apart from Christchurch, the South Island did not obtain many of the new industries. Dunedin, in particular, did not receive a share of the new industries commensurate with its importance as one of the Dominion's leading manufacturing areas. Indeed, so heavily concentrated were the new industries on the metropolitan areas that few other ports benefitted from them. The impact of the differential changes was reflected in a loss in shipments at Otago and gains at Auckland, Wellington and Lyttelton.

In spite of the new developments - many in single unit enterprises - the small establishment remained characteristic of New Zealand industry. The persistence of the small unit was favoured by high internal costs, the paucity of raw materials for a large industrial establishment and a domestic market divided amongst four main centres. Commodity movements generated by the small units were usually confined within each region or to adjacent regions. The emergence of new single unit enterprises, however, resulted in an increase

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38 Sutch, W.R.: Recent Changes in New Zealand, Wellington, 1936, p.135
in the long distance transfer of goods.

(v) **Changes in fuel technology:** The principal factor in the changes in fuel technology was the decline in the demand for coal, with improved fuel utilisation and its replacement by hydro electric power and fuel oil, the latter applying particularly to shipping. Its effect was widespread as there was not only a decline in shipments from the main coal ports on the west coast of the South Island, but a fall in receipts at almost all ports in New Zealand.

The changeover to petroleum products also had repercussions on the coastal trade. As the consumption of petrol increased sharply, there was a change in the method of handling petroleum products from packaged to bulk delivery. However, all ports which previously had received packaged petroleum products direct from overseas did not receive ocean terminals for bulk delivery of petroleum. The ports involved - Bluff, Nelson, Timaru and Gisborne - received the bulk of their petroleum coastwise. The changes in fuel technology, therefore, had varying effects on the receipts and shipments of individual ports.

(vi) **Changes in the significance of different methods of transport:** Variations in the coastal trade handled by New Zealand ports between 1926-36 reflected changes in the significance of rail and road transport and the policy of overseas shipping companies.

(a) **Changes in road and rail transport:** The volume of commodity movement was below the level of 1926 as it had not fully recovered from the shrinkage in traffic during the depression. There was, therefore, a keen struggle for the diminished trade available between motor, rail and coastal shipping services. The effect of the intense competition, which involved severe rate cutting by all three forms of transport, was to reduce the volume of commodity movements passing through the ports, as coastal shipping did not fare as well as other forms of transport. However, the effect varied between the three spheres of traffic operations that can be recognized in New Zealand. The three spheres are:

1. intra regional
2. intra island
3. inter island

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\(^{40}\) The consumption of petrol increased from 41,457 tons in 1926 to 72,107 tons in 1936. **Ibid. p.841.**
Unfortunately there is no evidence of the volume of commodity movements generated within the three spheres of traffic operations. In the absence of detailed information on commodity movements, it is not possible to decide whether the intra island movements were greater than the inter island commodity flow. It can be inferred, however, that most of the traffic originated and terminated within each region, as there was a marked fall off in traffic with an increase in distance from the main centres of population. The critical factor influencing the receipts and shipments of individual ports is not, however, the volume of traffic generated within each of the three spheres of traffic operations, but the changes in the competitive position of coastal shipping vis-à-vis other forms of transport. Each of the three patterns of circulation is, therefore, examined separately.

(1) Intra regional movements:—Fierce competition from road and rail transport resulted in a general decline in the volume of intra regional commodities handled by seaports between 1926-36. For short hauls up to 30 miles or for longer distances in the absence of railways — road transport could offer more frequent and speedier transport than coastal shipping. The rapid increase in the number of motor vehicles and the expansion of the all weather road network accelerated the decline of ports such as Hokianga, Kaipara, Mangawhai, Mokau, Waitara, Wairoa and Akaroa, which were hitherto virtually the sole outlets for the districts they served. Outside of the permitted area of operation, road transport indirectly captured trade previously carried by coastal shipping, as its feeder services extended the area served by the railways. Coastal shipping, also, suffered from direct competition from the railways, which could offer regular and more flexible intra regional services. The extension of the railway network proceeded more slowly between 1926-36, but its impact on the coastal trade was clearly reflected in the rapid decline

41 The only detailed information on changes in different methods of transport is 'General Survey of Transport', Annual Report of the Transport Department, A.J.H.R., H.40, 1936, pp.20-23.
43 In an attempt to regulate road motor transport, with a view to securing co-ordination between it and other forms of transport, the Transport Licensing Act was passed in 1931. It limited trucks to a 30 mile radius where they were in direct competition with the railways.
44 The total number of motor cars increased from 106,091 in 1926 to 152,475 in 1936 and the number of trucks from 5,836 to 18,068 over the same period. New Zealand Official Yearbook, 1938, p.319.
of Thames' and Tauranga's receipts and shipments after the completion of the railway link connecting the two centres with Auckland (1928). This competition offered by the extension of the railways was intensified by the differentiation between high and low value goods in the railway freight rates and government subsidies for fertiliser and lime. It enabled the railways to compete on favourable terms with coastal shipping for low value bulky commodities. The competition for high value goods was intensified in certain districts by granting special reductions in freight rates for full truck loads. For example, part of the loss in receipts at Whangarei could be attributed to the special reductions for full truck loads of goods between Auckland and stations north of and including Whangarei. The effect of railway and road competition was to reduce drastically the intra regional trade handled by New Zealand ports.

The contraction, however, was not universal. In isolated areas road transport was complementary to coastal shipping, rather than a competitor for it. Indeed, ports such as Awanui, Whangonui, Russell, Whakatane and Opotiki, which continued to thrive as land routes, were either poor, unavailable or longer than the sea route. Intra regional services persisted at other ports, as coastal ships - particularly scows and barges - were still unrivalled as the carriers of low value/high bulk freight such as cement, sand, shingle and artificial manures. In an attempt to consolidate the hold of shipping on bulk cargoes in the Auckland region, diesel engines were fitted to scows. The new developments were not sufficient, however, to offset the losses from road and rail competition.

(2) Intra island movements: - Intense competition from road and rail transport was also experienced in traffic originating and terminating within the same island. The competition from road transport, however, was not as severe as it was in the intra regional trade. Motor trucks were

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45 See Report of Committee of Inter departmental Representatives on the Operations of Coastal Services Controlled by the Northern Steam Ship Co. Ltd., Auckland, as Affected by Competitive Forms of Transport, Wellington, 1937, pp. 10-11.
47 With the decline in the passenger trade there was a change in the type of vessels employed from the large coaster with passenger accommodation to scows with large holds.
restricted, by the Transport Licensing Act (1931), to certain classes of roads (depending on their axle weight) and to a 30 mile radius in competition with the railways. As the government had bought out most of the long distance hauliers, road transport had little impact on the intra island trade. Yet, coastal shipping received little benefit from the regulation of road transport, as the railways - deprived of short hauls by road transport - intensified their competition for long hauls by offering concessions on bulky goods. Indeed, it was between 1926-36 that the full impact of the extension of the railway network from Christchurch to Greymouth (1924) and Auckland to New Plymouth (1933) was felt by coastal shipping. For example, the delayed effect of the completion of the Midland Railway to Greymouth was not felt by coastal shipping until the late twenties. With the changeover from sea to rail, however, there was a sharp decline in shipments from the West Coast and in the receipts of all East Coast (S.I.) ports ranging from Lyttelton in the north to Bluff in the south. The effect of the competition was, therefore, to reduce the volume of goods carried by coastal shipping in the intra island trade. Where railways were not in existence, or circuitous, however, coastal shipping retained its trade. Gisborne, for instance, was almost solely dependent on sea transport for the transmission of goods from other parts of the North Island, as there were no intra island railways and road access was extremely poor. Similarly, in the South Island the intra island trade persisted in the absence of direct rail links between the East Coast (S.I.) and Marlborough and Nelson, and between the West Coast (S.I.) and Nelson. Apart from the regions without direct rail connections, the receipts and shipments of individual ports suffered from rail competition.

(3) Inter island movements: Coastal shipping, in marked contrast to the other two spheres of traffic operations, dominated the inter island trade, as it was the only feasible way of moving large quantities of commodities between the North and South Islands.48 Ships carried the whole range of goods from bulky low value commodities, such as coal and cement, to light high value goods, such as radios. Road and rail transport were complementary to coastal shipping in this sphere as they provided the necessary

48 Air transport was very feebly developed in 1936. See New Zealand Official Yearbook, 1938, p.328.
links between producer and consumer. The only competition in this sphere was between the ports themselves. Ports with regular inter island services had a marked advantage over ports with less frequent connections. If goods were required quickly, for example, Lyttelton and Wellington - the termini of the daily inter island steamer express service - often handled them and mailed the goods to their destination, which was outside the areas in which the ports enjoyed a freight rate advantage over other centres. Thus, the importance of the inter island trade, in contrast to the other two spheres of traffic operations, varied with the frequency of shipping services.

(b) Changes in overseas shipping policy: - As the capacity of overseas shipping was not fully used during the depression, the shipping companies were willing to extend their services to meet the demands of the smaller ports, such as New Plymouth, Napier, Nelson and Bluff. This decision had repercussions on the coastal trade, as some of the pastoral produce, previously concentrated at the convenience of the shipping companies on Wellington and Auckland, was sent overseas direct. This practice, however, was not universal as the movement of goods to the main ports still continued to operate, not all ports having sufficient cargo to warrant a direct visit. The changes in shipping policy, therefore, had a differential impact on the ports engaged in the coastal trade.

The changes in the significance of different methods of transport and the other general factors affected the type of commodity handled by New Zealand seaports between 1926-36. In the absence of other data on the nature of the commodities handled, information can be obtained from an analysis of individual port totals. Unfortunately, the full impact of the changes cannot be obtained as the economies introduced during the depression resulted in a reduction in the number of returns from individual ports, from 48 in 1926 to 25 in 1936. All the main ports, however, are included in the returns for both years and some indication of the changes can be gauged from an analysis of the shipments (Table XIX). The outstanding feature of the changes in commodities between 1926-36 was the increased importance of flour, wheat, potatoes and

petroleum products and the decline in coal and cement. Thus, the effect of the general factors on the generators of commodity movements was to change their character, as well as to diminish their volume.

The Regional Conditions

The analysis of the general factors revealed that their impact on receipts and shipments varied between different regions. However, the general factors were not the only influences on receipts and shipments as there were also localised factors which appeared to be confined to a region, or even a single port. For example, there was a general decline in coal receipts in all regions, but at Whangarei there was an increase because the decline in production of the North Auckland Coalfield made it necessary for the cement works to draw on supplies from the West Coast (S.I.). Such localised influences, together with the regional expression of the general factors, produced wide variations in the significance of the coastal trade between different regions, expressed in terms of per capita tonnage (Table XX). There appears to be a close relationship between the availability of other forms of transport and coastal shipping. Where land transport networks were well developed, such as in Hawke's Bay, West Coast (N.I.) and East Coast (S.I.), the per capita tonnages were relatively low. Conversely, where land transport networks were less well developed, as in Auckland, Poverty Bay, Marlborough and Nelson, the per capita trade was high. The marked reduction in Auckland's per capita trade between 1926-36 probably reflected an improvement in communications. Differences between regions also emphasised the role of the South Island as a generator of trade and the North Island as a net recipient.

In view of the wide regional differences reflecting different patterns of circulation, an analysis is made of each of the eight regions. As the general factors incorporating data from the maps on receipts and shipments have already been discussed, there is only a brief analysis of the pertinent influences producing changes in the comparative gains and losses of ports.

To facilitate the analysis, the distinction between intra regional, intra island and inter island trade is retained. The available statistics

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51 Production declined from 111,918 tons in 1926 to 62,094 tons in 1936. See 'Mines Statement', A.J.H.R., C2, 1926, Table No.3, p.8 and 1936 Table No.4, p.17.
are not, however, sufficiently refined to provide a detailed breakdown of the coastal trade in the other three spheres of traffic operations. In the absence of any other method, an analysis of the commodity statistics of each individual port supplied an estimate of the volume of trade entering into the three spheres of traffic operations (Table XXI). The results were checked by balancing the imports against the receipts. It must be stressed, however, that the totals are only approximate. With the aid of the estimates (Table XXI), Tables XV, XVII, XXII, XXIII, XXIV and Figures 23, 25 and 26 the shipments and receipts of each region are examined, in turn, to identify the factors producing the significant changes at individual ports.

THE NORTH ISLAND

The North Island ports had almost 80,000 tons (Table XXII) more than they would have had if they had grown at the national rate between 1926-36. Changes in all three spheres of traffic operations contributed to the regional variations. The intra regional coastal trade declined, whereas the intra island and inter island trade increased (Table XXI).

1. THE AUCKLAND REGION

The Auckland region had over 76,000 tons less in 1936 than it would have had if it had grown at the national rate between 1926-36 (Table XXII). Whangarei, Auckland, Thames and Tauranga all made significant contributions to the loss. Indeed, Whakatane was the only port to record a modest gain (Fig.23).

Shipments

The decline in shipments was responsible for two thirds of the region's loss. Contrary to the regional trend, however, the losses were concentrated on Whangarei and Thames (Fig.25). Whangarei's negative result was due to the decline in intra regional coal and intra regional and intra island cement cargoes. The substantial loss at Thames, in comparison, resulted from the exhaustion of local supplies of kahikatea (white pine), which had been shipped to Auckland, in 1926, for making butter boxes. With a more balanced and diversified trade, Auckland recorded a gain as the port benefitted from the increased demand in all three spheres of operations for consumer goods. In particular, there were increased shipments to ports serving newly developed farming areas in North Auckland and the Bay of Plenty, as roads and railways were poorly developed. Yet, the increase was small compared with the losses at Whangarei and Thames.
Receipts

The region's loss of receipts, in contrast to shipments, was concentrated on Auckland and, to a lesser extent, on Tauranga (Fig. 26). In spite of the large population increase, Auckland suffered from a contraction of trade in all three spheres of traffic operations (Table XXI). Although there was an increased volume of wheat from the South Island and butter from regional ports, it was not sufficient to offset the decline in cement, softwoods (intra regional) and the massive loss of coal receipts (inter island). Indeed, even allowing for increased self sufficiency in certain commodities, Auckland appears to have made one of the slowest recoveries of the main centres from the depression. Except for Coromandel and Kawhia, which served marginal dairying areas, the other negative results probably stemmed from improvements in road transport, rather than from the effects of the depression. The changes, however, were not as spectacular as the extension of the railway line to Tauranga (1928), which deprived the port of a substantial portion of its receipts (artificial manures, flour and general goods). Indeed, so powerful was the effect of railway competition that, apart from Whangarei, which received an increased tonnage of coal to offset the decline of the local coalfield, the small positive gains were made outside the influence of the railway network. The gains, however, were so small that they did little to compensate for the marked losses at Auckland and Tauranga.

The impact of the changes in receipts and shipments decentralized cargo at the expense of Auckland (Table XXIII). It also disturbed the balance of flow at three of the regional ports (Table XXIV). With the decay of shipments of indigenous softwoods, Hokianga and Thames changed from having an excess of shipments to a surplus of receipts. Whakatane, in contrast, switched from being a net receiver in 1926 to a shipper in 1936. The effect of the movements on the regional pattern was small and the preponderance of receipts in the commodity movements remained virtually unchanged.

2. THE POVERTY BAY REGION

The Poverty Bay region had a small loss of 9,000 tons during the 1926-36 period (Table XXII). All of the loss was contributed by Gisborne, as Tokomaru Bay and Tologa Bay recorded gains (Fig. 23).
Shipments

All three ports, however, recorded small increases in shipments (Fig. 25), following the expansion of pastoral production. As cargoes were often insufficient to warrant direct visits from overseas ships, there was an increased movement of less perishable commodities (wool, tallow, hides and sheep skins), either in the intra regional trade from the Bay ports to Gisborne, or from all three ports to Napier or Auckland, where there were more frequent overseas shipping services. In addition, there was a rise in the inter island shipments of stock for fattening in Canterbury. Contrary to the regional trend, therefore, there was a slight gain in shipments.

Receipts

A marked fall in Gisborne's receipts was clearly responsible for the region's loss, as Tokomaru Bay and Tologa Bay more or less maintained their share of the trade (Fig. 26). Although Gisborne benefitted from increased petroleum receipts from Wellington and agricultural products from the South Island, to meet the hinterlands growing population, they were not sufficient to offset the marked decline in cement from Whangarei and coal from the West Coast (S.I.). As intra regional receipts remained important in the absence of an efficient road and rail network, the region's decline resulted from the changes in intra island and inter island trade (Table XXI).

3. THE HAWKE'S BAY REGION

The Hawke's Bay region had a comparative loss of over 18,000 tons during the 1926-36 period (Table XXII). Waikokopu, Wairau and Napier - the three regional ports - all contributed to the loss (Fig. 23).

Shipments

A decline in shipments contributed one half of the region's loss. The loss was concentrated on Napier, as intra regional shipments of wool, hides and sheepskins from Wairau and Waikokopu to Napier for export remained at their 1926 level (Fig. 25). Napier's loss resulted from a decline in intra regional shipments of relatively light, valuable commodities with the improvement of road transport within the region. Shipments of bulky goods (wool) in the intra island trade with Wellington were, however, well maintained.
Receipts

The decline in receipts was more evenly spread between the three ports (Fig. 26). A reduction in intra regional receipts, which followed the improvement in road communications, was the main reason for the decline at Waikokopu and Wairoa. In addition to the decline in intra regional receipts, Napier also suffered from a fall in inter island coal receipts (Table XXI). The full impact of the decline was not realised as there was a marked improvement in the receipts of intra island cargoes (cement, petroleum products, wines and spirits). Thus, the loss in receipts was not as severe as at Waikokopu and Wairoa.

The net effect of the changes in receipts and shipments intensified the concentration of trade on Napier (Table XXIII). It also created a more imbalanced flow, as over three quarters of the region's cargo was inbound in 1936 (Table XXIV).

4. WEST COAST (N.I.) REGION

The coastal trade of the West Coast (N.I.) region grew at a rate far greater than in any other region in the Dominion between 1926-36 (Table XXII). Wellington contributed most to the region's comparative gain of 182,000 tons, as Patea was the only other port to make a modest gain. Wanganui and New Plymouth, in contrast to the regional trend, recorded losses (Fig. 23).

Shipments

The changes in shipments reflect the differential regional pattern, with variations ranging from a large gain at Wellington to a sharp loss at Wanganui (Fig. 25). Negative variations were associated with a decline in intra regional cargoes. For example, as New Plymouth and Wanganui were granted extended overseas services, intra regional cargoes of butter and cheese, previously sent to Wellington, declined. Following the rise in pastoral production, Patea's intra regional shipments of cheese showed a marked increase, as the decision to extend overseas services did not affect the port. Wellington's intra regional shipments (beer, hardwoods and general cargo) rose also, but the port's main increase was derived from a gain in inter island shipments. Wellington's substantial increase was derived from the new and expanded fabricating and assembly industries developed in the Hutt Valley since 1926. The greatest regional increase in shipments, therefore, was concentrated on one port, strategically situated for distributing goods destined for the national market.
Receipts

The region's impressive, but less substantial, gain in receipts was repeated, with variations ranging from a large gain at Wellington to a modest loss at Wanganui (Fig. 26). The differential response reflected changes in the hinterland population of the two ports. Whereas Wellington enjoyed the greatest increase in population of any of the Dominion's urban areas, Wanganui recorded the only loss in the North Island. The diminished consuming power of Wanganui's hinterland was reflected in a decline in inter island shipments of cement, coal, oats, pollard and bran and petroleum products. Wellington, in contrast, recorded a sharp gain in coal receipts, as well as increased tonnages of agricultural products (flour, potatoes and wheat). As the comparative gains and losses were small at the other ports, the changes in receipts were primarily due to variations at Wellington and Wanganui.

The cumulative effect of changes in receipts and shipments was to heighten the concentration of trade on Wellington (Table XXIII). There were also extreme flows at most of the region's ports. Yet, the regional trade became more balanced with less emphasis on inbound cargoes (Table XXIV).

Trends in concentration between the leading regional ports in the North Island were, therefore, equally divided, with Napier and Wellington showing increased concentration and Auckland and Gisborne revealing decentralization (Table XXIII). The balance of flow remained relatively stable and the North Island retained its character as a net receiver of coastwise goods (Table XXIV).

THE SOUTH ISLAND

The South Island ports had in aggregate 80,000 tons less than they would have had if they had grown at the national rate between 1926-36 (Table XXII). As the intra regional movement of commodities by sea was small, the varying changes at individual ports hinged on the extent of the rise in the volume of inter island commodity movements and the decline of the intra island trade (Table XXI).

5. THE MARLBOROUGH REGION

The Marlborough region had a small gain of almost 5,000 tons during the 1926-36 period (Table XXII). A sharp increase at Picton was responsible

for the gain (Fig. 23), as Wairau recorded a loss and Kaikoura was closed with the extension of the railway line from Blenheim and improved motor transport connections.

Shipments

Changes in shipments mirrored regional variations (Fig. 25). Picton's impressive gain resulted from the increased volume of inter island shipments of pastoral produce (wool and butter) for transhipment at Wellington and agricultural products (beans and peas, potatoes and wheat) to meet the growing demand in the North Island. Wairau did not fare as well as there was a decreased demand for chaff in Wellington, with the changeover from horses to motors, for transport, within the metropolitan area.

Receipts

A small net loss in receipts, however, reduced the gain from shipments (Fig. 26). It resulted from the decline in intra island cargoes of coal, cement and softwoods at Picton and Wairau being greater than the gains in inter island shipments of manures and petroleum products.

The changes in receipts and shipments intensified the concentration of cargo on Picton (Table XXIII). Indeed, this port's proportionate share of the regional trade became the greatest of any of the leading ports. The changes also resulted in a reversal in the port's and the region's flow from an surplus of receipts in 1926 to an excess of shipments in 1936 (Table XXIV).

6. THE NELSON REGION

The Nelson region had 55,000 more tons than it would have had if it had grown at the national rate between 1926-36 (Table XXII). Although all three ports recorded positive results, the main gain was at Nelson itself (Fig. 23).

Shipments

Variations in shipments paralleled the regional trends, with Nelson making a larger gain than other ports (Fig. 25). Waitapu's gain was associated with increased primary production in an area with poor land communications, whereas the positive results at Nelson and Motueka were due to the marked increase in inter island shipments of fresh fruits and specialised agricultural shipments (hops and tobacco). As Nelson was the focus of the land communications in the region, most of the fruit was channelled through the port, either for domestic consumption in the North Island or for transhipment overseas at Wellington.
Receipts

The region's positive result was also boosted by a marked increase in the region's receipts. The increase concentrated largely on Nelson (Fig. 26), was associated with a sharp rise in population. Indeed, consumer demand was well maintained in the Nelson region, probably because its diversified economy did not feel the full impact of the depression, as did agricultural areas wholly dependent on exporting primary produce, or urban areas devoted to manufacturing. There were even increased receipts of cement and coal, in addition to petroleum products, artificial manures and general cargo. Nelson, therefore, was the only South Island region to record a gain in receipts and shipments.

The net result of the changes was to increase the concentration of cargo on Nelson (Table XXIII). It also produced a better balance for inbound and outbound cargoes (Table XXIV). Indeed, the relatively balanced flow was characteristic of the regions bordering Cook Strait.

7. THE WEST COAST (S.I.)

The West Coast had a comparative loss of 203,000 tons between 1926-36 (Table XXII). Almost the whole of the loss, however, was concentrated on Westport, as Greymouth experienced a small loss and Hokitika, contrary to regional trends, recorded a gain (Fig. 23).

Shipments

A decline in shipments, resulting in a heavy loss at Westport, was largely responsible for the region's negative result (Fig. 25). The changeover of ships to fuel oil severely affected Westport, as it specialised in providing coal for bunkering at Wellington. Greymouth, on the other hand, was less affected by the changeover to fuel oil, as it relied on shipping steam-raising and gas-making coals. The demand for these coals recovered well from the depression and the port's shipments were maintained, despite competition from the Midland Railway for intra island cargoes. Neither Greymouth nor Westport, however, benefitted from the increased shipments of softwoods to meet the upsurge in building activity in the North Island, as the trade was channelled through the revived port of Hokitika. The gain in softwoods, however, did little to offset the region's loss. Yet, in spite of the loss, this region still generated more cargo than any other (Table XV).
Receipts

The receipts of West Coast ports (Fig. 26), in contrast to shipments, remained remarkably stable between 1926-36. It is not surprising, as the loss from the fall in the standard of living was compensated by a marked increase in population. Yet, Westport still recorded a sharp loss, as improved communications with the railhead at Reefton deprived the port of intra island commodities (flour and beer) from the East Coast (S.I.). As the loss was offset by a rise in receipts at Greymouth and Hokitika, there was little change in this region's receipts, which remained smaller than those of any region (Table XVII).

The effect of the changes led to the decentralization of cargo from Westport (Table XXIII). However, it did little to alter the region's heavy outbound flow (Table XXIV).

8. THE EAST COAST (S.I.) REGION

The East Coast region, unlike the West Coast, recorded a gain of over 63,000 tons (Table XXII). Gains at Lyttelton, Timaru and Bluff, overcoming the losses at Otago and Invercargill, were responsible for the region's positive showing (Fig. 23).

Shipments

The differential variations between individual ports were largely derived from changes in inter island shipments (Fig. 25), which made up 95 per cent of the region's outbound cargoes. An increase in the volume of the inter island shipments of agricultural produce (wheat, flour, potatoes, oatmeal, pollard and bran), stimulated by the protection from overseas competition and the growth of population in the North Island, was responsible for the gains at Lyttelton, Timaru and Bluff. However, Otago and Oamaru did not benefit greatly from the increased movements of agricultural produce, as their hinterlands were geared to producing oats, chaff and barley for which the demand in the North Island declined with the substitution of horse drawn wagons by motor vehicles. The loss at Otago was accentuated by the opening of branch plants of established Dunedin firms in the North Island. In particular, the decentralization of the brewing industry deprived the port of one of its main shipments. The net effect of the changes, however, was for the region to record a marked gain in shipments.
Receipts

Losses in receipts, particularly at Lyttelton, Otago and Invercargill (Fig. 26), reduced the region's gain from shipments. The changes were associated largely with a reorganisation of the intra island distribution of coal and petroleum products, rather than with the inter island trade, as almost all ports handled increased tonnages of sugar and manufactured goods from the North Island. Lyttelton and Otago were affected by the changeover from shipping to railng coal from the West Coast (S.I.), as it deprived both ports of a substantial portion of their intra island receipts (Table XXI). Invercargill's loss, however, was due solely to the silting of the port. The port's trade was transferred to Bluff which, contrary to the regional trend, showed a marked gain in receipts. Bluff's receipts were also boosted by an increase in petroleum products as the port became dependent on coastal supplies, having not been chosen as the site for a bulk terminal for overseas tankers. Yet, the gain at Bluff was small in comparison with the combined loss of the other ports.

The cumulative effect of the changes in receipts and shipments heightened the concentration of trade on Lyttelton (Table XXIII). It also resulted in Lyttelton's changing from a port having a surplus of shipments in 1926 to one with an excess of shipments in 1936 (Table XXIV). Conversely, Otago switched from being a net shipper to a receiver, over the same period. There was also a reversal in the region's net flow from inbound to outbound, although the region's trade remained relatively balanced.

Three of the four South Island regions, therefore, revealed increased concentration on the leading port (Table XXIII). However, as the balance between the inbound and outbound movements remained relatively stable, the South Island preserved its fundamental character as a net shipper of commodities to the North Island.

It is, therefore, apparent from the analysis that the changes in a port's status stemmed from its varying reaction to a large number of regional and local influences. However, it is possible to recognise predominant factors in the changes. The gains at Wellington and Nelson, for example, were derived from increases in inter island receipts and shipments. Auckland's loss, in contrast, was due to a decline in intra regional receipts, whereas
Lyttelton's gain resulted from a rise in inter island shipments. At Tauranga the critical factor was the extension of the railway, but at other ports the change was centred on a single commodity: the loss at Westport, for example, was due almost solely to the decline in coal shipments. Indeed, so varied were the predominant characteristics that it is difficult to generalise above the regional and local level.

In the light of the foregoing analysis, there is a need to refine the classic concept of a port, drawing and distributing its coastal trade from an area over which it enjoys a freight rate advantage over other ports. Without recognition of the three spheres of traffic operations in New Zealand, the concept is too superficial to account for the changes in the status of ports in the coastal trade. Indeed, there is not one hinterland but a nested hierarchy of three, encompassing the inter regional, intra island and inter island patterns of circulation. An analysis of each of the three patterns is necessary, as the importance of their contribution to each port depends on the availability of other forms of transport to perform the interchange of commodities between the producer and consumer.

IIIT TRANSHIPMENT TONNAGE

Transhipments are the third component that comprises the gross tonnage. They are goods interchanged between ships within the confines of New Zealand ports. In 1926 16 ports transhipped over 940,000 tons of cargo,\(^{53}\) which was almost 12 per cent of the gross tonnage. The trade declined during the depression, reaching the lowest point of almost 471,000 tons in 1933 (Table XXV). However, unlike the overseas and coastal trade, it did not make the same recovery from the depression, as the aggregate trade handled by ten ports in 1936 was only 560,000 tons, which accounted for less than eight per cent of the gross tonnage. It appears that transhipments were affected not only by the prevailing economic conditions but by long term structural changes.

Changes in Status

Yet, in spite of the decline in the volume of transhipment tonnage, there was a remarkable stability in the ranking of ports on the transhipment scale for 1926 and 1936 (Fig. 27, Table XXVI). Among the grade A ports, each handling individually over five per cent of the transhipment tonnage, Wellington

\(^{53}\) Transhipments are counted twice in the gross tonnage.
retained a substantial share of the trade, despite a large absolute loss. (Table XXVI). With a small absolute loss, Auckland, the other grade A port, increased its relative share. In 1936 Nelson also moved to grade A status, but Otago and Napier did not improve on their grade B status. As the remaining ports all handled, individually, less than one per cent of the transhipment trade, they were accorded grade C status. Their trade was relatively insignificant as only Lyttelton handled over 1,000 tons. They also seemed most unstable as there were six fewer grade C ports in 1936, compared with 1926.

Changes in Concentration

When the changes in concentration are examined (Fig.28), it is clear that the changes between 1926-36 were confined almost entirely to Auckland, Wellington, Napier and Nelson. Wellington showed a comparative loss, but Auckland/Nelson recorded gains. The variations at the other ports are small and do not warrant a detailed examination.

Explanatory Variables

In accounting for the changes in transhipments four classes of trade are involved. They are:-

(A) Coastal to coastal.

Cargo which has been loaded in a vessel at a New Zealand port and is transhipped to another vessel for discharge at another New Zealand port.

(B) Coastal to overseas.

Cargo which has been loaded in a vessel at a New Zealand port and is transhipped to another vessel for discharge overseas.

(C) Overseas to coastal.

Cargo which has come from overseas and is transhipped to another vessel for discharge at a New Zealand port.

(D) Overseas to overseas.

Cargo which has come from overseas and is transhipped for discharge outside New Zealand.

As most of the goods transferred between ships were in the first three classes in 1926 and 1936 (Table XXVII), it appears, from the limited data available, that the variations in tonnage handled by individual ports are associated with:-

54 New Zealand’s entrepôt (overseas to overseas) trade was very feebly developed.
(i) Improvements in road and rail communications.

(ii) Alterations in the pattern of direct shipments.

(iii) Changes in select commodities.

In formulating the variables, it is clear that the traditional concept of a hinterland does not apply to the transhipment trade. It seems that the volume of goods transhipped reflects both the port's overseas status and its relative opportunities for distributing cargo by sea to smaller ports. Each of the variables is now examined in turn.

(i) Improvements in road and rail communications:- It is assumed in the first instance that the general decline in transhipments is a direct result of the substitution of road and rail transport for coastal shipping. In 1926 cargo was transhipped between overseas and coastal vessels because either the overseas ships were too large to visit the smaller ports or there was insufficient cargo to warrant a direct visit. Similarly, goods were transferred from larger to smaller coastal ships to service the isolated bar harbours on the New Zealand coast. By 1936 much of the traffic had been captured by the expanded road and rail network. Improved land communications to hitherto isolated areas resulted in the cessation of transshipping at eight grade C ports operating in 1926 and a decline in transhipments at Napier, Nelson, Lyttelton and Otago. The changeover had a selective impact at Auckland. There was a decline in the coastal to overseas transhipments, but the overseas to coastal trade was not greatly affected as coastal shipping remains an important and integral part of the transport system of the Auckland region. Similarly, at Wellington the improvements in communications could only partially account for the variations of transhipments as the port's main function was to tranship goods to and from the South Island. The improvements in land transport, therefore, seem to have had a selective impact on the individual variations in transhipments.

(ii) Alterations in the pattern of direct shipments:- The second premise had an even more selective impact on transhipments, compared with the improvements in land communications. It affected only the ports which changed from transshipping goods coastwise in 1926 to exporting them direct in 1936.
The change influenced the transhipment trade of Napier and Nelson, but had its greatest effect on Wellington. Butter and cheese from Wanganui and New Plymouth and a portion of the Nelson apple crop were exported direct in 1936, whereas they had been transhipped at Wellington in 1926. It appears, therefore, that the alterations in direct shipments had a highly localised effect on the variations in transhipments.

(iii) Changes in select commodities:— The transhipment trade also appears to have been affected by changes within a select group of commodities. One of the most important changes was the cessation of bunkering overseas and coastal vessels from colliers or coal hulks, with the substitution of oil for coal fuel in ships' boilers. It resulted in a decline in coastal to coastal and coastal to overseas transhipments at Auckland and Napier, which served as bunkering ports for their locally based coastal fleets. However, it had its most pronounced effect on Wellington, which was the Dominion's main bunkering port.

Wellington was also more affected than the other transhipment ports by changes in the methods of handling petroleum products. In 1926 cased petroleum products passed between ships, but in 1936 imported supplies entered the ocean terminals before being redistributed by coastal tankers. The petroleum products were, therefore, credited to the direct coastal shipments of the ports concerned. From the analysis it is apparent that the changes in select commodities had a greater impact on Wellington than on the other transhipment ports.

Although it is only possible to express the relative contribution of the three variables in general terms, it seems on intuitive grounds that they are the most pertinent in accounting for the changes in transhipments.

III INTERPRETATION OF THE GROSS TONNAGE RANK

After examining and interpreting the variations in the status of ports

55 The necessity of shipping butter and cheese from Wanganui and New Plymouth was reduced between 1926-36, with a rise in the production of dairy produce in Wellington's hinterland and increased shipments for transhipment from Patea.

56 In 1926 coal was brought from the bar ports of Westport and Greymouth to fifteen coal hulks at Wellington, to bunker overseas and coastal vessels. It is estimated that the use of oil fuel reduced coal transhipments at Wellington by 200,000 tons.
on the overseas, coastal and transhipment scales, we propose to bring the various analyses together to account for the changes in the rank of ports on the gross scale. There does not appear to be a common basis for the variations as each component exhibited a different pattern. The increased centralization on the two leading ports in the overseas trade was reinforced only at Wellington, in the coastal trade, as there was a dispersion of cargo from Auckland. In the transhipment trade the reverse was true, with increased concentration on Auckland and dispersion from Wellington. Clearly, the three components of the gross tonnage varied widely between 1926-36, in response to different stimuli. Any interpretation of the changes in the status of ports on the gross tonnage scale has, therefore, to take into account the variations in the ranking of ports on the overseas, coastal and transhipment scales.

From the summary of the changes between 1926-36 (Table XVIII) it is apparent that the variations in the coastal and overseas rankings contributed most to the changes in the status on the gross tonnage scale, as there were few variations in the ranking of ports in the transhipment trade.

The changes in the ranking of the major ports resulted from differing changes in all three components of the gross tonnage. Auckland's displacement of Wellington as the principal port resulted from the port's improved ranking on the overseas scale. Although there was no change in transhipments, the diminished volume of the trade contributed also to Wellington's positional change. On the other hand, Lyttelton's slight improvement stemmed from a rise in the port's coastal ranking. The movement of Otago into fourth position was not due to any change in its ranking in the overseas, coastal or transhipment trade, but to the decline of Westport on all three scales. This led to the reclassification of Westport as a secondary port in 1936 and reduced the number of major ports to four.

The changes in the ranking of the secondary ports, handling over one and under five per cent of the gross trade, were also due, primarily, to the changes in the overseas and coastal components. Bluff's rise on the gross tonnage scale resulted from an improvement in the port's coastal trade, but Nelson's sharp rise was broadly based on improvements in both the coastal and overseas rankings and promotion to grade A status in transhipments. The decline at Wanganui stemmed from a drop in the port's coastal ratings,
whereas Timaru’s decline was due to a fall in the overseas rankings. Paradoxically, Whangarei retained its coastal position and improved its overseas ranking, but still recorded a decline on the gross scale. In 1936, the secondary ports were augmented by the former minor port of Picton, which recorded a marked improvement in its coastal ranking. Together with the former major port of Westport, the addition of Picton boosted the number of secondary ports to 11 in 1936.

The changes among the minor ports, handling individually less than one per cent of the gross trade, were due largely to variations in the coastal rankings, as their overseas and transhipment components were feebly developed. Hokitika’s marked rise in the rankings was the principal change due solely to the coastal trade. The other significant changes involving the decline of Thames and Tauranga and the rise of Tologa Bay, Russell and Tokomaru Bay were accentuated by slight changes in the overseas and transhipment components. However, the ferment among the minor ports is illusory, for the margins between individual centres are small and, therefore, of less importance than the positional changes among the secondary and major ports.

Thus, the varying response of ports to the depression of the thirties resulted from changes in their positions on the overseas, coastal and transhipment scales. In view of the economic upheaval, it is surprising that the changes did not produce a greater turmoil in the rankings.
CHAPTER V

CHANGES IN THE STATUS
OF NEW ZEALAND SEAPORTS

1950-1961:
CHAPTER OUTLINE

CHANGES IN THE STATUS OF NEW ZEALAND SEAPORTS 1950-1961

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Changes in Concentration

IIO OVERSEAS TONNAGE

Changes in Status
Changes in Concentration
The Pattern of Analysis
Comprehensive Factors
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   (a). Factors distorting the hinterland concept.
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      (5). The paying load and cargo nucleus.
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   (b). The effect of the distortion of the hinterland concept.

(ii). The dispersion of bulky commodities on a wider range of ports and the concentration of perishable commodities on fewer ports.

(iii). The direct intervention of the government in the free flow of imports.

(iv). The impact of new industrial developments.

(v). The changes in a select group of commodities.

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IIIC

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The Pattern of Analysis
An Examination of Receipts and Shipments

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   (3). inter island movements.
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THE AUCKLAND REGION
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Receipts

THE EAST COAST (N.I.) REGION
Shipments
Receipts

THE WEST COAST (N.I.) REGION
Shipments
Receipts

THE SOUTH ISLAND

THE NELSON REGION
Shipments
Receipts

THE WEST COAST (S.I.) REGION
Shipments
Receipts

THE EAST COAST (S.I.) REGION
Shipments
Receipts

IIIT

TRANSHIPMENT TONNAGE

Changes in Status
Changes in Concentration
Explanatory Variables

(i). The decentralization of overseas shipping on a wider
   range of ports.

II

INTERPRETATION OF THE GROSS TONNAGE RANK
CHAPTER V

CHANGES IN THE STATUS OF NEW ZEALAND SEAPORTS 1950-1961

The expansion of the New Zealand economy after the second World War produced an even greater turmoil among the ranking of ports than the depression of the thirties (Fig.29). On the resumption of peace-time trading in 1946 there were 37 ports handling 7.7m. tons. Since then there has been a substantial and progressive rise in the gross tonnage handled by New Zealand ports (Table XXIX), apart from the temporary setbacks of the waterfront strike in 1951 and the periodic disturbances associated with the balance of payments crises in 1953 and 1958. The peak tonnage was reached in 1963, when 31 ports handled 13.5m. tons. In an attempt to describe and explain the effect of the post-war expansion on the respective status of ports, their relative positions are analysed in 1950 and 1961. In 1950 33 ports handled 8.1m. tons, whereas in 1961 30 ports handled 12.6m. tons – an increase of 44 per cent.

II ANALYSIS OF THE GROSS TONNAGE RANK

Changes in Status

A breakdown of the gross tonnage for individual ports in 1950 and 1961 (Table XXX) reveals that in both years the trade was concentrated on a limited number of ports. However, compared with the intense concentration of 1950, there appears to have been some decentralization on a wider range of ports in 1961. The notion is confirmed by arranging ports according to their percentage of the gross tonnage in 1950 and 1961 (Fig.30). For strict comparability with the previous analysis of ports in 1926 and 1936, the division between major and secondary ports is retained at five per cent and between secondary and minor at one per cent. Within this framework, three ports moved from one class to another between 1950-61 and several changed their ranking in their respective classes.

In 1950 Auckland, Wellington, Lyttelton and Otago ranked as major ports in order of importance (Fig.30). Collectively they completely dominated the trade, handling almost three quarters of the gross tonnage. In 1961
Auckland, Wellington and Lyttelton were still classed as major ports, without any changes in their respective positions. However, Otago, the fourth ranking port in 1950, failed to meet the qualifying standard of five per cent in 1961 and was reclassified as a secondary port. The loss of Otago was compensated by the inclusion of Tauranga - a minor port in 1950 - among the major ports. Yet, in spite of the promotion of Tauranga, the aggregate share of the major ports had declined to only two thirds of the gross tonnage in 1961.

There were eight secondary ports in 1950, ranging from New Plymouth at the upper end of the scale to Timaru at the lower extreme (Fig.30). Together, the secondary ports handled just over one fifth of the gross tonnage. None of the eight ports was re-classified in 1961, but the addition of Otago, Tarakohe and the former minor ports of Onehunga and Wanganui increased the number of secondary ports to 12. The striking feature of the changes was that all the secondary ports, except Greymouth and Westport, had increased their relative share of the gross tonnage. However, the only ports to move up on the scale were Bluff, Timaru and Whangarei. Napier retained its respective position, but New Plymouth and Nelson fell in the ranking. The most startling declines were at Westport and Greymouth, both of which fell several places in the ranking. Despite the losses at Westport and Greymouth, the total share of the secondary ports rose by ten per cent to over 30 per cent of the gross tonnage in 1961. Indeed, the keynote of the period 1950-61 was the rise of the secondary ports.

In 1950 there were 21 minor ports, ranging from Wanganui at the upper end of the range to Half Moon Bay at the lower extreme (Fig.30). Collectively, the minor ports handled over five per cent of the gross tonnage in 1950. Their number and importance, however, had declined sharply by 1961 as there were only 14 minor ports handling less than four per cent of the gross tonnage. Apart from the spectacular rise of Tauranga to major status, the variations did not produce sharp changes in rank among the minor ports between 1950-61. The main changes were the promotion of Onehunga and Wanganui to secondary status, the closure of Whakatane, Opotiki, Patea, Hokianga and Hokitika, and

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1 Tarakohe is the port serving the Golden Bay Cement Co. works. It has been shipping cement and receiving coal by sea since 1911, but it was not recorded in the statistics until 1960.
the opening of Jacksons Bay, Kaiapoi and Ohiwa for commercial use. Within
the group, only Picton showed any marked increase in relative importance.
However, as the margins separating the minor ports were small, the changes
in status were of less significance compared with variations in the secondary
and major classes. Thus, the main feature of the changes in status between
1950-61 was the rise in the importance of the secondary group of ports.

Changes in Concentration

The analysis of changes in the ranking of ports on the gross tonnage
scale does little to reveal the full impact of the changes in concentration
between 1950-61. A measurement of the changes is, therefore, obtained by
calculating the difference between the actual tonnage of a port in 1961 and
hypothetical figures showing what the level would have been if the ports had
grown at the national rate between 1950-61. The resulting positive and
negative variations reveal (Fig.31, Table XXX) that there has been a decentral-
ization of cargo at the expense of Auckland, Wellington, Otago, Westport
and Greymouth. Lyttelton alone, of the four ports serving the metropolitan
areas, recorded a gain. However, the main gains from the decentralization of
cargo were at Tauranga, Napier and Bluff. The changes were obscured by
disturbances produced by the opening and closing of certain ports. The
resulting chaotic pattern, with sharp differences in sign as well as magnitude,
presents a problem in interpretation.

In attempting to interpret such an incoherent pattern, the method of
analysis used in the previous chapter is repeated. The first step is, there-
fore, to break-down the gross tonnage into its three components of the over-
seas, coastal and transhipment trade. Each of the component elements is
examined separately by analysing the changes in the rank of ports on the over-
seas, coastal and transhipment scales. The results of the analyses are then
drawn together to explain the changes in the gross tonnage rank of ports.

II0 OVERSEAS TONNAGE

In 1950 there were 16 ports engaged in the overseas trade. They
handled collectively 4.7m. tons, which accounted for half of the gross tonnage
of New Zealand. Apart from temporary setbacks in 1953 and 1958-9, there was
a steady expansion in the volume of cargo handled by the ports. (Table XXXI).
As the growth rate of the overseas trade had outstripped the coastal and
transhipment components, the traffic of 7.7m. tons in 1961 accounted for 62 per cent of the gross tonnage. However, contrary to world trends of concentrating cargo on fewer ports, the number of ports handling overseas trade had increased to 19 in 1961. It is apparent from an examination of the overseas trade handled by individual ports in 1950 and 1961 (Table XXIII) that the rise in the number of ports was accompanied by a decentralization of cargo.

Changes in Status

The impression is corroborated by arranging ports according to their percentage of the overseas tonnage (Fig.32). A framework for examining the changes is provided by grading ports A, B and C. For strict comparability with the study of the overseas trade in 1926-36, the division between grade A and B is retained at five per cent and between B and C at one per cent.

Auckland, Wellington, Lyttelton, Otago and New Plymouth - handling over five per cent of the overseas tonnage - may be classed in order of importance as grade A ports on the overseas scale in 1950 (Fig.32). The ports so overwhelmingly dominated the overseas traffic that their aggregate share was over nine tenths of the total overseas tonnage. Although the relative share of the total tonnage handled by grade A ports remained virtually the same in 1961, the dominance exercised by the five leading ports in 1950 had been weakened by an increase in the number of grade A ports to seven, with the inclusion of Tauranga and Napier. In spite of the increased number of grade A ports, Auckland, Wellington, Lyttelton and New Plymouth retained their respective rankings in 1961. However, only Lyttelton improved its relative share of the national total. Otago, in contrast, regarded traditionally as one of the four "main ports", fell sharply from fourth to seventh position on the overseas scale. The significance of the change was eclipsed by the phenomenal rise of Tauranga from eighteenth to fourth position. As no change in rank was involved at Napier, the emergence of Tauranga overshadowed the port's movement from grade B to grade A status.

In 1950 Napier, together with Bluff and Timaru, handling between one and five per cent, may be classed as grade B ports (Fig.32). Although they experienced large absolute increases in tonnage, none of the ports improved

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\[^2\text{Mayer, H.M. : New Zealand Geographer, 48, p.17.}\]
its respective position on the overseas scale as all three ports had been surpassed by Tauranga. However, the relative increase at Napier was sufficient for the port to move classes and even retain its position, but Bluff, in spite of an impressive gain in absolute tonnage, dropped one place in the rankings to eighth position in 1961. With a smaller absolute increase, Timaru fared even worse than Bluff as it dropped two places to tenth position. Yet, the share of the grade B ports fell only slightly to seven per cent in 1961 as their number was augmented by Nelson. The growth at Nelson was so marked that it moved ahead of Timaru in the rankings.

In 1950, Nelson had been one of the seven grade C ports which handled individually less than one per cent of the overseas tonnage (Fig.32). The situation among the grade C ports, handling in aggregate less than one per cent of the total overseas trade, was so fluid that, although the number of ports in the class had increased to nine in 1961, only three of the original seven in 1950 retained grade C status. Tauranga had been transferred to grade A and Nelson to grade B, and Raglan and Onehunga ceased to handle overseas cargo. However, the losses were offset by the return of the overseas trade to Gisborne, Bay of Islands, Picton, Westport, Wanganui and Jacksons Bay. These ports, together with Whangarei, Greymouth and Camara of the original seven, handled in aggregate over two per cent of the overseas tonnage in 1961. Among the grade C ports, however, only Whangarei showed a marked relative increase in importance. Yet, the collective growth in importance of the grade C ports since 1950 highlighted the dispersion of overseas cargo over a wider range of ports.

Changes in Concentration

However, the changes in the ranking of ports on the overseas scale did not reveal changes in the concentration of tonnage between individual ports. A scale for determining changes in concentration is, therefore, obtained by calculating the difference between the actual tonnage of a port in 1961 and hypothetical figures showing what the tonnage would have been if the ports had grown at the national rate between 1950 and 1961.

The application of the method to the overseas trade (Fig.33, Table XXXII) emphasised the widespread dispersion of cargo. Only Lyttelton of the grade A ports recorded a comparative gain as Auckland, Wellington, Otago
and New Plymouth all showed varying losses. Even Lyttelton's increase, however, was outstripped by the gains at Tauranga, Napier and Bluff. Nelson and Whangarei also recorded significant gains, but they were less substantial than Lyttelton's. Surprisingly, Timaru had not kept pace with the national rate of growth and recorded a small comparative loss. The other changes, however, were anticipated, for with the exception of Greymouth and Oamaru, none of the ports involved received cargo in both of the selected years. Raglan and Onehunga, recording a comparative loss, received overseas cargo in 1950 only, whereas the Bay of Islands, Gisborne, Wanganui, Picton, Westport and Jacksons Bay, showing comparative gains, handled overseas cargo only in 1961. The widespread gains at most of the smaller ports emphasised that, with the exception of Lyttelton, the dispersion of cargo had benefitted grade B and C ports on the overseas tonnage scale in 1950.

The Pattern of Analysis

In interpreting the comparative changes between 1950-61, it is possible to distinguish between comprehensive factors, which affected the whole of the overseas trade, and sectional factors, which influenced only imports and exports. The sole comprehensive factor is the decision to decentralize overseas shipping on a wider range of ports. Although the decision affected imports and exports, it did not account for the detailed variations as the two component elements of the overseas trade responded to different stimuli. Imports were composed chiefly of industrial raw materials and manufactured goods, whereas the exports were composed primarily of pastoral produce. Imports and exports remained fundamentally distinct in spite of some blurring of the difference, with the export of manufactured timber products and other manufactured goods. They are, therefore, examined separately. Incorporating the comprehensive and sectional factors, the pattern of analysis is to consider the effect of the decentralization of overseas shipping, before embarking on a detailed examination of imports and exports.

Comprehensive Factors

(i). The decentralization of shipping on a wider range of ports:

It is clear that the variations in the overseas trade between 1950-61 were closely connected with the decentralization of overseas shipping on a wider
range of ports. In 1950, over 98 per cent of the overseas trade was concentrated on Auckland, Wellington, Lyttelton and Otago and, to a lesser extent, on New Plymouth, Napier, Bluff and Timaru, which collectively served the main centres of population (Table XXXII). The intense concentration reflected the restrictions imposed by the British Ministry of War Transport during the second World War. The emergency regulations virtually confined overseas shipping to Auckland, Wellington, Lyttelton and Otago so that maximum use could be made of existing shipping space and the risk of enemy attack steaming around the coast, to pick up and discharge cargo, was reduced to a minimum.

After the War, the restrictions were eased and New Plymouth, Napier, Bluff and Timaru were worked more fully. However, the main shipping companies—apart from the Union Steam Ship of New Zealand, engaged primarily in the trans-Tasman trade with Australia and the Pacific Islands—still refused to return to Opua (Bay of Islands), Tokomaru Bay, Gisborne, Waikokopu, Wanganui, Nelson, Picton and Oamaru, which had been worked in 1940, or to extend their services to Whangarei and Tauranga. The government was, however, subjected to severe pressure from local interests, with optimistic views of the future expansion and benefits to be obtained for their district by re-opening these ports. In particular, as it was claimed that none of the existing ports

3The New Zealand Shipping Co. Ltd. (including Federal Steam Navigation Co.), Shaw Savill and Albion Ltd., Port Line Ltd. and Blue Star Line (N.Z.) Ltd.
4Smaller ships are involved in the trans-Tasman trade. As they are less discriminatory in their draught requirements they are able to visit a greater number of ports than the larger liners.
5The port of Waikokopu was dismantled during the war. With the extension of the railway line from Napier to Wairoa the port was no longer required.
6Overseas tankers had resumed their services to Nelson in 1946, but other overseas services had not been reinstated.
7The lines forming the New Zealand Shipping Conference laid down the following minimum requirements for working overseas vessels at New Zealand ports in 1950:-
(a) sufficient depth of water to allow a modern vessel to enter and leave a port half loaded.
(b) a sufficient length of quay in good repair for vessels to lie safely and to operate five hatches simultaneously.
(c) a sufficient labour force to operate six gangs and to enable operations to be carried out at six hatches.
(d) sufficient mechanical appliances and rail facilities to enable cargo to be loaded and unloaded quickly.
See Marine Department Files serial No. 3/13/220.
could serve the area effectively, there was a pressing need to provide port facilities for the proposed utilisation of the exotic forests of the Volcanic Plateau in the centre of the North Island. The government sought to allay the pressure by setting up a series of committees of inquiry to assess the situation and make recommendations.

The problem of port facilities for the Volcanic Plateau was considered separately. As Auckland was too distant and too congested to be regarded as a suitable port, the Committee of Inquiry was directed to investigate the relative merits of ports in the Bay of Plenty, sited at Tauranga (Mount Maunganui) and Whakatane. Their subsequent report recommended that Tauranga be developed. Although the extension of existing facilities at Tauranga was ostensibly designed to cater for the timber trade in prospect, and capable of subsequent development to accommodate refrigerated vessels, its development resulted in the growth of a strong import trade to serve the new fertiliser works, flour mills, and oil installations set up at the port.

The other ports, except Whangarei, came under the purview of an inter-departmental government investigation. It recommended the re-opening of Nelson, Gisborne and Bay of Islands (Opua) on the basis of the amount of cargo available for export and the possible developments in their hinterlands. The recommendations were adopted, although in 1958 a subsequent committee permitted the re-opening of Picton. The re-opening of these ports was primarily for the export trade as few overseas ships discharged at Bay of Islands, Picton and Nelson and none called at Gisborne.

In respect of Bay of Islands (Opua), Whangarei disputed the findings of the report. The dispute resulted in the setting up of a committee of inquiry to decide whether Whangarei or Bay of Islands was the most suitable port to serve Northland. After an exhaustive examination of the relative merits of the two ports, Whangarei was chosen. However, the findings were

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9 Economic Report on the Advisability of Decentralizing Overseas Shipping, Wellington, 1950 (mimeographed). The Committee considered that the reversion from telescoped frozen meat (implemented to save shipping space during the war) to whole carcases would mean that ships drew less and would be accommodated in ports used prior to the second World War. They optimistically estimated that the change in the stowage of cargo would save two days on the coast.


disregarded by Bay of Islands. Consequently, both ports have developed rival facilities, resulting in a grim war of conflicting interests. Bay of Islands has been used for exporting pastoral produce, whereas Whangarei has captured most of the goods imported direct to Northland.

Of the remaining ports which had handled cargo in 1939, Waikokopu and Tokomaru Bay remained closed, but Opua and Wanganui were still able to offer facilities to trans-Tasman shipping. Thus, the effect of re-opening certain ports and extending facilities at others was to encourage the dispersion of overseas cargo.

This marked dispersion of overseas trade on a wider range of ports did not, however, bring the tangible economic benefits which the proponents of the decentralization of shipping envisaged. There has been no compensatory quicker turn-round with the increased number of ports. Indeed, the statistical information available (Fig.34) shows that the number of days spent by Conference Line vessels on the New Zealand coast had increased alarmingly, from 51.68 days in 1949-50 to 62.17 days in 1961, with a marked deterioration in the annual amount of cargo handled. Apart from the advantages conferred on local shipping interests from using their nearest port, the dispersion of the overseas trade between 1950-61 was accompanied by few economic benefits. Indeed, the dispersion was contrary to the movements of population, business and commercial organisations which were becoming centralized on Auckland, Wellington and Christchurch. Thus, it is within this framework provided by the decentralization of overseas shipping and the dispersion of cargo that the detailed variations in imports and exports have to be considered.

**Sectional Factors**

**IMPORTS**

In harmony with the growing number of ports dealing with all forms

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12 The Bay of Islands wharf at Opua was opened to overseas shipping in 1957 and Whangarei regularly received overseas shipping from 1959.

13 The bulk of the relatively high value goods for consumption in Northland was imported through Auckland in 1961.


of overseas tonnage, there was an increase in the number of ports handling imports. Sixteen ports dealt with 3.5m. tons in 1950, whereas 18 ports handled 5.7m. tons in 1961. The dispersion of imports on a wider range of ports was accentuated by marked changes in individual tonnages (Table XXXIII). Although all ports handling cargo in both years, except Oamaru, showed absolute increases in imports, the changes in volume between ports bore little relation to the ranking of ports on the overseas tonnage scale in 1950. Auckland, the primate port on the scale, did have the largest gain in imports, but the other main increases were, in order of importance, at Lyttelton, Tauranga, Wellington, Napier and Bluff. However, the gains at New Plymouth, Nelson, Greymouth, Timaru and Otago were on a more modest scale. Thus, all ports, with the exception of Oamaru, recorded varying increases in absolute tonnage between 1950-61.

Changes in Concentration

The impact of the absolute changes in imports is examined by calculating the difference between the actual tonnage for each port in 1961 and hypothetical figures showing what the level of tonnage would have been had the port grown at the same rate as the Dominion between 1950 and 1961. It reveals that the intense concentration on the five leading ports, handling over 95 per cent of the imports in 1950, had been dissipated (Fig.35). Four of the five ports - Auckland, Wellington, Otago and New Plymouth - had large comparative losses. Only Lyttelton of the major ports in 1950 recorded a comparative gain. However, Lyttelton was outstripped by the phenomenal growth at Tauranga and an impressive increase at Napier. Even Bluff almost equalled Lyttelton's increase. Whangarei and Nelson, also, made marked positive gains. The remaining ports experienced only slight gains or losses. As the dispersion of imports had been so effective, the share of the five leading ports declined to less than 83 per cent. There is, therefore, clear evidence of the decentralization of cargo from four of the five grade A ports.

Explanatory Variables

The attempt to interpret the changes in imports between 1950-61 is marred by the non-availability of data. Many factors, such as the effect of the government import restrictions, which may have been pertinent in explaining the variations in tonnage, have to be ignored. In spite of the limitations,
it is possible, within the framework provided by the decentralization of overseas shipping, to identify some of the complex physical and human factors which appear to be associated with variations in imports. The following factors are thought worthy of consideration:

(i). changes in the population of a port's hinterland.

(ii). the dispersion of bulky commodities on a wider range of ports and the concentration of perishable commodities on fewer ports.

(iii). the direct intervention of the government in the free flow of imports.

(iv). the impact of new industrial developments.

(v). the changes in a select group of commodities.

In formulating the variables, considerable reliance is placed on the available knowledge relating to the processes of port growth and decline. The method is to examine each of the variables in turn, to assess its contribution to the changes in the importance of individual ports.

(i). The changes in the population of a port's hinterland:— Although the dispersion of cargo, which followed the re-opening of ports to overseas shipping, bore little relationship to the growing concentration of population on the metropolitan areas, it appears from previous research that a close relationship between a port's imports and its hinterland population would be expected. Indeed, the scatter diagrams constructed for 1950 and 1961 (Fig. 36) show a close relationship between the variables. It is, therefore, expected that the variations in imports would be related to changes in the population of a port's hinterland. Defining a port's hinterland as the area in which it enjoys a freight advantage by railway over other ports (Fig. 37), the assump-

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18 The railway freight rates are chosen as the arbiter of a port's hinterland as road transport, except under special licence, is restricted to a 40 mile radius (previously 30 miles) when in competition with the railway. For the purposes of defining the hinterlands, the freight charges on Class C goods are used. The break-even point between ports on these rates is a function of distance except where there is a "port railway" line. The three port links each carried a special local freight rate as follows: Lyttelton to Christchurch £1.2s.10d, Port Chalmers to Dunedin 19s.6d. and New Plymouth Breakwater to New Plymouth 15s.10d. As the port railway charge is not based on distance, the break-even point, which involved the ports with special links, becomes one of cost. The operations of the local rates in 1961 affected the competitive position of ports with the port railway links as the extra charge reduced the area in which they enjoyed a freight rate advantage.
tion is tested by plotting the variations in imports against the changes in population, both expressed as a percentage of the national total, on a scatter diagram (Fig.38). However, the resulting diagram does not reveal a simple relationship. Indeed, there is little evidence that the variations in imports reacted in harmony with the changes in the population of a port's hinterland between 1950 and 1961.

Yet, the poor relationship between the two variables does not rule out the influences of changes in population on the variations in imports. It appears that the validity of allocating imports and population according to a hinterland defined on the basis of its freight rate advantage over other ports can be questioned as an over-simplification of reality. On further investigation it seems that there were other factors present distorting the hinterland concept between 1950-61. As the concept is of critical significance for predicting trends in imports, a detailed examination of its implication is warranted.¹⁹

(a). Factors distorting the hinterland concept:— The basic notion of a hinterland, that a seaport will attract all the import traffic destined for consumption within the area in which it enjoys a freight rate advantage over other ports, ²⁰ has to be modified in New Zealand. It seems that the flow of traffic between seaports and inland centres was always being affected by one or more of the following considerations between 1950-61:—

(1). Port capacity and facilities:— At a given inland location, a manufacturer may have required raw materials from abroad, which were regularly carried in overseas ships too large to be accommodated at the nearest port. ²¹ For example, imports ultimately destined for consumption

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²⁰ Implicit in the assumption is that the communications for each port are uniformly available and equally efficient.

²¹ Prior to the second World War few ships in the New Zealand trade exceeded 500ft. in length or required more than 30ft. draught. After the war, however, when the Conference Lines had a virtual monopoly of the import trade the size of ships increased rapidly. Many of the ports which had previously handled overseas shipping, such as Oamaru, did not have the depth or width to accommodate the new vessels. The infiltration of the Dutch Lines into the New Zealand trade from 1959 onwards resulted in a reversion to small single screw ships which were more manœuvrable than the new twin screw vessels built after the war. The Dutch vessels were able to work Whangarei and
within the hinterlands of Tauranga and Whangarei were handled at Auckland as neither port could accommodate vessels exceeding 550 feet in length and requiring draughts over 25 feet. Indeed, among New Zealand ports, only Auckland, Wellington, Lyttelton and Port Chalmers (Otago) could handle fully laden vessels over 575 feet in length with draughts exceeding 30 feet (Fig. 39). The requirements of large ships, therefore, restricted them to a limited number of ports. Further, during certain periods of the year (especially between November and March) the nearest port may have been out of favour because it had insufficient working berths, involving ships in a waste of time which the shipping companies were not prepared to face. The goods were, therefore, discharged at another port and forwarded by internal transport to their destination. As the imports to New Zealand were composed of a wide variety of different types of cargo, they needed cranes and shed space which were not always available at the nearest port. Specific cargoes often required special handling for prompt discharge. Heavy indivisible lifts had, therefore, to go to ports such as Auckland, Wellington, Lyttelton and Otago with heavy lifting capacity, or to a port where a suitable vessel (floating crane) had lifting gear available. On occasions, therefore, the need for special facilities often diverted shipping and imports from the nearest port.

(2). The influence of markets:—The established market for particular commodities was not always found where the goods were used. For example, almost 30 per cent of the Dominion’s tea was handled at Auckland where there was the combined attraction of highly skilled samplers and

Tauranga which the Conference Lines had hitherto refused to work. The Dutch Lines were so successful in attracting cargo that the Conference Lines were forced to operate smaller and speedier ships on some of their services. As the Dutch Lines were admitted to the Conference in 1962, there may be a return to larger ships on some services.

In 1961 only three ports – Auckland, Wellington and Lyttelton – could handle a fully laden G.P. tanker 575 feet in length on a draught of 30-31 feet. There was no tanker terminal at Port Chalmers (Otago). New Plymouth, Napier, Timaru, Dunedin and Bluff could handle the vessels on a restricted draught. However, Whangarei, Tauranga and Nelson could not handle a 575 feet vessel even on a restricted draught. See Clarke, A.J.: Report to the Whangarei Harbour Board on Port Facilities Required, also a Study of a Terminal Layout and Navigational Aids, London, 1961. (Mimeographed).

Although there are wide variations in the number and size of berths at individual ports there is little evidence that there was any pronounced shortage of berthage space in 1961, except at the peak period of the year. The delays were due to a shortage of labour and insufficient railway wagons rather than a physical shortage of berthage space.
blenders and the largest consumer market.24 As the "competitive imports"25 of relatively high value and low bulk, such as tea, tend to be shipped to ports in closest proximity to the largest centres of population, the inward-bound liners discharge their relatively high value cargo in the port areas of Auckland, Wellington, Lyttelton and Otago, which correspond to the Dominion's major urban nuclei. The attraction of these areas was that they could offer a wider range of commercial and business facilities, compared with other centres. Most of the importing firms had their central offices in one of the main metropolitan areas and re-distributed to the hinterlands of other ports. Indeed, a hierarchical arrangement of the distribution of imports can be recognised in New Zealand (Fig.40). The Class I ports - in order of importance Auckland, Wellington, Lyttelton and Otago - served an extra-regional market with a wide variety of relatively high value goods as well as a regional one with bulky commodities. Class II ports, in contrast, served a regional market with bulky goods and a limited range of general cargo, whereas Class III ports handled only bulky imports for a restricted local market. The hierarchical arrangement, therefore, often resulted in the nearest port being by-passed for another port where relatively high value goods were concerned.

(3). The frequency and range of shipping services:
The nearest port was often passed over by an importer if a suitable alternative port offered more frequent services or a direct service with a particular country. It can be seen from the number of vessels calling in both 1950 and 1961 that Auckland, Wellington, Lyttelton and Otago monopolised the shipping services (Table XXXIV). Consequently, the four ports handled cargo which was destined for places outside the area in which they enjoyed a freight rate advantage. Goods required at Timaru, for example, were often imported through Lyttelton or Otago. Although the practice resulted in importers paying more by using an alternative port, the increased costs were offset by savings in

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25 See Griffin, pp.54-5 Griffin considers that certain bulk commodities (cement, sugar and gypsum) are non-competitive because their location is determined by the existence of a processing plant at a port. In contrast, relatively high value goods, on which the cost of inland transport is small, can conceivably be handled by several competing ports.
capital outlay and interest charges. If superior shipping services were available, the freight rate advantage of a port did not always ensure that local imports would pass through it.

(4). The Importance of the first port of call:- Manufacturers in New Zealand, concerned with the frequency and regularity of imports, often drew their supplies from the first port of call and had them forwarded either overland or by sea rather than wait for the ship to come to the nearest port. This policy again favoured Auckland, Wellington, Lyttelton and Otago as they collectively received almost the whole of the first calls of overseas vessels in 1950 and 1961 (Table XXXV). Yet, within this group of ports, Auckland was pre-eminent as it claimed two-thirds of the first arrivals in both years. Indeed, the basic itinerary of the shipping companies was to discharge at Auckland, Wellington, Lyttelton and Otago in that order, so that Auckland claimed a disproportionate share of the new arrivals. As the function of "maritime express" was always centred on the port with the greatest number of scheduled entries, cargoes of high intrinsic value and low bulk, for which the speed of delivery was important, were off-loaded at Auckland and forwarded by the internal transport network to their destination. Overseas ships often took two or three weeks to discharge their full cargo at all four ports. Dunedin was invariably the last port of discharge. Any delays at Auckland,

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26 An improvement in shipping services often has important repercussions on the competitive position of individual firms. A Dunedin chocolate manufacturer imports 1,800 tons from Takoradi. When there was no regular service, the beans all came in one chartered ship. The manufacturer had to pay for the complete fumigation and the cargo all at once and provide additional storage space. The capital outlay was reduced when the Dutch Lines instituted a three monthly service with West Africa.

27 What was even more important was that these ports received almost all of the first arrivals of scheduled liners which carried the bulk of the relatively high value cargoes.


29 Auckland is the first port of discharge for all or most of the cargo services operated by the New Zealand Shipping Co. Ltd., Port Line (West Coast U.K. Service), Federal Steam Navigation Co. (America and Australian Line), Crusader Shipping Co., Manz Line, Columbus Line (Pacific Division), Maritime Services (Zealand and Pacific), Bank Line, Mitto Shosen, British and Scandinavian Joint Service from the Continent and the Union Steam Ship Co. (Far Eastern and Trans-Pacific Services). Most of the passenger lines have chosen Auckland as their first port of call in New Zealand. Sometimes it is their sole port of disembarkation, but on other occasions it alternates with Wellington.
Lyttelton or Wellington forced the local merchants to meet commitments by way of overdrafts and interest charges ranging from £10 to £5,000 per annum have been incurred. Merchants served by ports other than those serving the metropolitan centres were at an even greater disadvantage if they used the local port.

(5). The paying load and cargo nucleus:- The shipping companies serving New Zealand endeavoured to limit calls to a few discharge ports where sufficient cargo was regularly required. Having established the prospect of a regular cargo nucleus, the companies were prepared to take cargo for more distant ports up to the limit of the ship's capacity. However, in many cases it was not worthwhile to visit the other ports to deliver such additional cargo which may have been forwarded overland or by coastal ship. For example, as the cargo for Otago on the West Indies - New Zealand service was marginal, the scheduled call was often omitted. In such cases the greater amount of cargo was dealt with in accordance with the hinterland principle, but the lesser amounts were not directed through the nearest port.

(6). Port charges:- Although there is no uniformity in port charges for facilities and services provided for the shipping companies at individual ports, there is little evidence, as there is in overseas countries.

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30 In some cases Dunedin merchants lose their markets at their rivals import their goods through Auckland, Wellington and Lyttelton and have them on display before the ship reaches the local port. Indeed, it is standard practice for ships held up in North Island ports to transship to Wellington. See 'Report of the Royal Commission of Inquiry into the Waterfront Industry', H.R. H. 50. 1952, p.191.

31 The major shipping companies organised their itineraries in 1961 on the average quantity of cargo discharged at each port. It resulted in the basic pattern of discharging geographically from north to south at Auckland, Wellington, Lyttelton and Otago with occasional calls at Bluff, Napier, Timaru and New Plymouth. In certain circumstances some companies, such as the Conference Lines on their West Coast U.K. service, did not announce their full New Zealand itinerary until the ship was at sea. In this case they called at the port which was receiving the largest amount of cargo.

of port charges at one port driving cargo to another port. An examination of the port charges for a hypothetical 10,000 net registered tons ship, which required a pilot and stayed five days in port, reveals that there was a difference of almost £600 between the nearest and the cheapest ports in 1961.\(^3\) (Table XXXVI). However, the maximum differential between neighbouring ports was less than £360. When the cost of land transport is considered the differential appears small. The costs of sending goods through a port are, therefore, relatively small when compared with the cost of land transport. The whole of the port charges represent but a few miles of railway. For example, had a ship desired to discharge 200 tons at either New Plymouth or Wellington in 1961, the differential in port charges would not have been a prime consideration, for it would have represented less than five miles in railway freight charges. Apparently port charges do little to distort the hinterland concept.\(^4\)

(7). Agreed railway charges: In general, freight rates are based on mileage, but New Zealand Railways did agree with certain manufacturers to carry goods at a rate which took no account of the freight rate basis. However, it applied only to a limited number of ports. Any universal application of the principle would invalidate the hinterland concept.

Thus, there were factors present which constantly deflected the application of the concept of a hinterland based on freight rate charges. The distortion was most pronounced where superior handling facilities were required or where high quality goods were involved. Their combined influence worked persuasively in favour of the larger port, at the expense of the smaller one.

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\(^3\)The cost of handling cargo at individual ports is not comparable as the degree of responsibility accepted by the harbour boards for cargo handling varies between ports. Wellington and Nelson carry out the complete duties of stevedores and wharfingers. They handle the cargo from the ship's slings into the sheds, from the sheds to the vehicles and vice versa. At the 'railway ports' of Lyttelton, New Plymouth, Oamaru and Port Chalmers (Otago) the Railways Department acts as wharfinger, collects all wharfage and remits the same to the harbour boards, less a percentage for collection. At Auckland a different system is employed. The board provides sheds and appliances, puts in a traffic manager and others to control the general wharf traffic, and other officers to control the position of the goods in the sheds. However, the labour to transport the cargo further from the sheds to the ships slings or vice versa is provided by the shipping companies, which undertake responsibility for the quality and condition of the cargo until it is received by the consignee. See Burke, A.D.: 'Harbour Boards' in Local Government in New Zealand, Wellington, 1949, p.110.

\(^4\)There is evidence that trade will operate in spite of unfavourable elements in the scale of port charges if the commerce is attractive on other counts.
A large port was made even larger than was warranted on the cargo consumed in its hinterland. Port charges and agreed railway rates, however, had very little influence on the movement of goods. It is clear, therefore, that freight rates were not the sole arbiter of the distribution of imports among ports.

(b). The effect of the distortion of the hinterland concept:

Some indication of the effect of these factors on the hinterland concept can be gauged by discovering to what extent each port served the area in which it enjoyed a freight rate advantage. Assuming that each individual in New Zealand has the same consuming power, a measurement can be derived from subtracting the actual import tonnage of a port from the hypothetical tonnage that would be expected in terms of the population of its hinterland. The hypothetical value is obtained from the following formula:

\[
\frac{\text{Total N.Z. imports}}{\text{Total N.Z. population}} \times \text{Hinterland population of a port}
\]

The technique is applied in 1950 when the consumption of imports was 1.37 tons per capita (Table XXXVII). It reveals the problems of using the hinterland population to predict changes in imports as there are wide variations between actual and expected tonnages. Only Auckland, Wellington, Otago and New Plymouth, of the 17 ports, received more imports in 1950 than was expected on the basis of their population. Clearly Auckland and Wellington performed the dominant roles in importing goods from overseas. The large excess of tonnage at Auckland would have accounted for the large deficits at Whangarei, Bay of Islands, Tauranga, Gisborne and possibly Napier, whereas Wellington's excess was probably largely responsible for the deficits at Napier, Lyttelton and the other South Island ports, except Otago. The latter port may have shown some independence of Wellington, but it could not fulfill the demands of the adjacent hinterlands of Bluff and Oamaru. New Plymouth, the other port to show an excess, satisfied the needs of its hinterland, importing little for adjacent areas.

Similar results were obtained in 1961, when the consumption of imports had risen to 2.41m. tons. Again they revealed that only four of the 17 ports

35 In reality the assumption is distorted by the disparity in the consuming power of Maoris and Europeans.
received more imports than was expected, on the basis of their respective populations (Table XXXVIII). Auckland and Wellington retained their positions, although their excess tonnage was not as great as in 1950. Auckland still accounted for the deficits at Bay of Islands, Whangarei, Tauranga and possibly at Gisborne, but Napier now had an excess tonnage. The surplus at the latter port was probably due to the forwarding of imports to Gisborne. Wellington still supplied a large proportion of the South Island's requirements and met the deficit at New Plymouth. However, Lyttelton emerged in 1961 with a marked excess over the expected tonnage as it now served effectively the whole of the South Island. Otago, on the other hand, was in a less favourable position with the growth of Bluff and showed a marked deficit.

As there were marked changes between 1950-61, an attempt is made to discover to what extent the variations in imports have been distributed in terms of population. A measurement of change is derived from the hypothetical tonnage which would have been expected if the imports had been distributed in terms of the changes in population. The change is expressed by the formula:-

\[
\frac{1961 \text{ N.Z. imports}}{1961 \text{ N.Z. population}} - \frac{1950 \text{ N.Z. imports}}{1950 \text{ N.Z. population}} = \text{per capita change}
\]

(2) \[ \frac{\text{Per capita change} \times \text{Changes in hinterland population}}{1950-61} = \text{hypothetical tonnage change.} \]

(3) \[ \text{Hypothetical tonnage change - actual change.} \]

Had the imports kept pace with the changes in population between 1950-61, the difference between the actual and expected values would have been zero.

The results, however, reveal marked differences between the two values (Table XXXIX). Imports had outstripped the changes in population at Lyttelton, Bluff, Timaru, Whangarei and Napier. However, the imports at Auckland, New Plymouth, Otago, Gisborne, Camarau and Picton fell short of the tonnage expected on the basis of the changes in population. Imports at Wellington, Westport, Greymouth, Bay of Islands and Nelson more or less kept pace with the changes in population. The marked variations from the expected tonnages suggest the presence of factors other than population.

(ii). The dispersion and concentration of individual commodities:-

One of the most cogent factors distorting the relationship between population and imports in 1950-61 was the dispersion of bulk commodities (oil, hardwoods and manures) and general goods on a wider range of ports and the concentration
of perishable goods (fresh fruit) on fewer ports. Some indication of the changes in the relative degrees of concentration can be gauged from the ogives of each of the five commodities (Fig.41). The changes represented an attempt by the distributors of all five commodities to overcome the problem of marketing goods in New Zealand.

In 1950, eight ocean terminals - four in each island - handled the refined petroleum imports of 1m. tons. 36 (Table XL). Each of the ports served a well defined area in which the prices charged increased with the distance of the point of consumption from the port. The pattern was complicated by the redistribution of imports by coastal tanker from Wellington and Lyttelton to Gisborne, Picton and Timaru, which did not receive overseas tankers. 38 The main changes in this pattern in 1961 resulted in a reassessment of hinterland boundaries, which had a differential impact on individual ports. Although no terminal suffered an absolute loss in import tonnage, the changes resulted in a slower rate of growth at Auckland and Otago and an accelerated increase at Lyttelton and Bluff. The fall in tonnage handled by the first four ports, from over 91 per cent in 1950 to almost 75 per cent in 1961, clearly reflected the dispersion of petroleum imports on a wider range of ports (Fig.41.).

36 In 1961 Auckland, Wellington, Lyttelton and Otago were designated "main ports" for discharging petroleum products on account of their depth of water, adequate storage, berthing facilities and sufficiently high annual throughput to justify handling fully loaded tankers. As the large tankers did not unload a full cargo at any of the four "secondary ports" of Napier, New Plymouth, Nelson and Bluff, a price differential of 1d. per gallon on motor spirit was charged because additional costs were incurred in travelling to and unloading at more than one port. The differentials on heavy fuel oil per ton were Dunedin 5/-, New Plymouth 20/-, Whangarei 40/-, Bluff 40/-, Napier 40/-, Nelson 40/-, Timaru (ex Christchurch) 81/9 and Oamaru (ex Dunedin) 56/-. The differentials on gas oil were 23d. per ton at Nelson, New Plymouth, Tauranga, Whangarei, Napier and Bluff, 3d. Oamaru and Timaru, 33d. Picton, 33d. Wanganui and 43d. Gisborne.


38 Wellington and Lyttelton also distributed special grades of oil to the other ports as the quantities did not warrant a direct call.

39 The difference of 1d. per gallon on motor spirit between the 'main' and 'secondary' ports was abolished in 1960. The abolition resulted in marginal changes in the areas served. The differentials on fuel oil and gas oil were unchanged.
The variations in artificial manure imports appear to have had a greater impact than the changes in petroleum imports between 1950-61 as more ports were involved in the changes (Table XII). Of the six ports handling artificial manures in 1950, four - Auckland, New Plymouth, Otago and Lyttelton - served the superphosphate works which accounted for over 96 per cent of the artificial manure imports. By 1961, the number of ports handling manures had doubled. However, the main changes in absolute tonnage were confined to Napier, Bluff, Tauranga and Lyttelton, serving new or expanded superphosphate works and Auckland, Otago and New Plymouth, which were most affected by the new developments. As the changes resulted in the latter group of ports recording a loss in manure imports and the former group experiencing large increases, there was a marked dispersion of manure imports. So radical was the effect of the changes that the four leading ports handled only 77 per cent of the manure imports in 1961 (Fig.41 B).

The dispersion of the imports of hardwoods was spread over a wider range of ports than that of manures between 1950-61. Eight ports handled the import of hardwoods in 1950 (Table XLII). With the subsequent decentralization of shipping on a wider range of ports, the number of centres dealing with hardwoods rose to 17 in 1961. This represented extreme dispersion as every port dealing with imports must have handled hardwoods. However, as the first four ports retained over 86 per cent of the tonnage of hardwoods in 1961 (a loss of over 7 per cent compared with 1950), it is apparent that the dispersion was not as severe as for manures and petroleum imports (Fig.41 C).

The dispersion of imports was not confined solely to bulky goods between 1950-61. There was even a change in commodities classed as "other goods", from a position in 1950 where the four ports serving the metropolitan areas handled 95 per cent of the tonnage to one where they dealt with over 90 per cent in 1961 (Table XLIII). The ports did not react in the same way.

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40 Imports of manure to Wanganui ceased in 1940. Since then manures have been imported through New Plymouth. The increased costs of transport through being unable to use the local port have been offset by a general levy on other fertiliser works.

41 As most of the bulk commodities are classed separately in the list of commodities handled by New Zealand ports, it is presumed that 'other goods' would have been composed primarily of general cargo (i.e. miscellaneous goods packed in boxes, bales, bags, barrels and other containers).
Auckland retained its relative share of "other goods" as its main competing ports, Whangarei and Tauranga, concentrated almost exclusively on bulky commodities. Similarly, Lyttelton enjoyed a slight increase as it had no serious rivals for general goods. In contrast, both Wellington and Otago were influenced by the emergence of competing ports. Wellington's relative share declined sharply between 1950-61, with the growth in trade at New Plymouth, Napier and Nelson, whereas the smaller decline at Otago was due to improved shipping services at Bluff. The dispersion of general cargo or "other goods" had, therefore, a more selective impact on the leading ports than did the variations in hardwoods, petroleum products and manures (Fig. 41D).

The increased centralization of fresh fruit imports was far outweighed by the dispersion of "other goods" and bulky commodities. Yet, the changes in fresh fruit imports were worthy of consideration as they had a marked effect on the changes in imports. Although the number of ports handling fresh fruit imports had declined by only one between 1950-61 (Table XLIV), there had been an important shift in emphasis which concentrated imports on Wellington, Auckland and Lyttelton. The change reflected the improvement in internal transport within New Zealand as any area within the North and South Island could be served within 24 hours by normal transport services from these ports. Consequently, the tonnage handled by the first few ports rose slightly between 1950-61, in striking contrast to their trade in bulk commodities and general goods (Fig. 41E).

The movements in tonnage of the five commodities have had a distorting effect on the relationship between changes in population and variations in imports. As the population of a port's hinterland - in spite of its apparent shortcomings - cannot be neglected for any predictive purposes, an examination of the relationship between the tonnage of each of the commodities and population in 1950 and 1961 seems warranted. For each of the selected years the relationship is tested by plotting the percentage of each of the five commodities received by individual ports against its hinterland population on a scatter diagram. If there is a more harmonious relationship between the variables, due to the changes between 1950 and 1961, it will be expressed by a closer approximation of individual ports to a straight line in 1961 than in 1950. It appears that the concentration of fresh fruit and the dispersion of the bulky commodities and general cargo resulted in a closer relationship
(Fig.4-2) and any predictive work can assume a simple relationship between the variables. However, there was little improvement in the relationship between population and manures\(^{(42)}\) (Fig.4-2). So poor was the relationship that further work on imports and population must take the anomaly into account.

(iii). Government intervention:-- Government interference in the free flow of imports appears to be a further factor which reacted independently of population changes. The amount of control over imports exercised by the government has varied with changes in the balance of payments.\(^{(43)}\) It resulted in wide fluctuations in imports between 1950-61. However, it has been impossible to gauge the impact of licensing on each individual port as there was no areal break-down of statistics.

Some indication of the character and influence of government intervention is derived from examining the fluctuations in grain imports.\(^{(44)}\) The control of the importation of grain and flour and of the distribution of imported and locally grown wheat is vested in the Wheat Committee.\(^{(45)}\) Their general policy appears to embody two basic aims:--

(a) explicitly to keep the import of overseas wheat to a minimum

(b) implicitly to rationalise the distribution of grain milling industry in New Zealand.

The application of this policy between 1950-61 was most effective in respect of flour imports, but it had little influence on the imports of grain. In 1950, imports of grain amounted to 145,772 tons (Table XLV). They increased in succeeding years as the local wheat production dropped away. In 1958, however, more positive action was taken to reduce the imports of overseas

\(^{(42)}\) Changes in livestock units would probably provide a better yardstick than population for predicting variations in the import of manures.

\(^{(43)}\) Import licensing schedules, originally introduced in 1938, apply at present to twelve monthly periods ending 30th July. The permitted imports tend to vary with the New Zealand balance of payments and schedules have, on occasions, been altered materially where there have been sudden fluctuations in the balance of payments. They are affected particularly by fluctuations in the prices and volume of New Zealand produce.

\(^{(44)}\) Imports of hardwoods provide another example as they are rigidly controlled by the Government.

\(^{(45)}\) The regulations prohibiting the importing of wheat or wheaten flour, except under a permit granted by the Ministry of Industries and Commerce, were instituted in 1936.
wheat. The government increased the overall price of wheat and released new high yielding varieties. It resulted in an increase in the area threshed, from 83,936 acres in the season 1957-8 to 186,268 acres in 1961-2.

The developments increasing the production of wheat were associated with the attempt to rationalise the grain milling industry. As the increased yields of high quality wheat were obtained largely from Canterbury and North Otago, the Wheat Committee allocated the bulk of wheat to local mills and reduced imports through Lyttelton, Timaru and Oamaru, from 46,678 tons in 1950 to only 5,007 tons in 1961 (Table XLV). As the mills in these areas were originally based on raw materials, the Wheat Committee had reinstated the industry on part of its original base. Although the North Island mills were forced to take a larger quantity of New Zealand grain, it was insufficient for their needs. The Wheat Committee, therefore, permitted the import of Australian wheat to North Island ports to increase, to offset the difference between local production and needs (Table XLV). In 1950, Auckland, Wellington, New Plymouth and Napier had handled the grain imports. However, with the increased use of local grain and the concentration of production on larger units, New Plymouth and Napier had ceased to import grain by 1961. Instead, imports were concentrated on Wellington, Auckland and Tauranga, serving the larger producer units, which permitted the bulk handling of wheat. The location of the two new producing units at Tauranga further rationalises the grain milling industry by countering the imbalance of having two-thirds of the consumers in the North Island. Thus, the attempt at rationalising the grain milling industry has had important repercussions on the imports of ports in

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46 The price of wheat grown in the South Island was increased by 2/- a bushel and in the North Island by 6d, per bushel for the 1958-9 season. In 1961 the price for wheat was 13/6 a bushel for the South Island and 14/6 in the North Island. The Australian price was 5/2 1/2. See New Zealand Official Yearbook, 1963, pp.437-8.

47 The new, high yielding varieties were Arawa and Aotea. They were also considered to be high quality strains which did not require the admixture of Australian wheat to produce a good baking flour.


49 When most of the mills were established in the late nineteenth century the South Island also had the largest population.

50 The number of grain mills declined from 47 in 1950 to 32 in 1961. In the former year there were 34 in the South Island compared with only 26 in 1961. Each mill is allocated an annual quota by the Wheat Committee. A firm can only expand production by buying another quota. It is claimed that the system has an inhibiting effect on locational change and the changeover to large units of production.
both the North and South Islands.

(iv). The impact of new industrial development: Unfortunately, as with government intervention, the impact of increased maturity in the character of New Zealand industries on the variations in import tonnage cannot be measured from available statistics. However, it is possible to obtain some indication of its effect from specific examples. For instance, the development of rubber making in Auckland, Wellington and Christchurch after the second World War resulted in a decline in the imports of bulky rubber goods through their respective ports as the imports of raw latex did not compensate for the loss in tonnage. Similarly, there was also a decline in cement, from 68,055 tons in 1950 to 2,967 tons in 1961, due to the increase in the capacity of existing works and the opening of a new plant. From a position of acute cement shortage in 1950, which demanded overseas imports, the sudden expansion of the industry left New Zealand with excess capacity in 1961 and only special varieties of cement were licensed to enter the country. However, the cement and rubber industries are not wholly representative of the current trends in manufacturing as industries using imported raw materials or semi-manufactured goods had expanded faster than those using domestic raw materials. The import content of New Zealand manufacturing industries has, therefore, remained high. Despite this trend, there is sufficient evidence in the rubber and cement industries to suggest that the attempt to change the pattern of industrial development, by encouraging an industry to carry production through from the earliest to the final stage of production, has had some influence on the variations in imports. If the policy is vigorously applied in the future, it should have an even greater impact on the tonnage handled by New Zealand seaports.54

51 Rubber goods are classified as 'other goods' in the transport statistics. It is, therefore, not possible to obtain an estimate of the tonnage involved.
52 The cement works at Portland (Whangarei), Tarakohe (Golden Bay) and Dunedin were all expanded.
Changes in a select group of commodities: Implicit in the selection of commodities for individual examination is the assumption that the changes in imports are confined to a select group of commodities. The validity of the assumption is tested by plotting the collective variations in the absolute tonnage of the commodities previously examined against the total changes in imports. These changes in the select group of commodities are expressed by the formula:

$$(\text{Group A 1961} - \text{Group A 1950}) - (\text{Group B 1950} - \text{Group B 1961})$$

where group A includes petroleum products, fertiliser, hardwoods, fresh fruit and manures and "other goods" in tons

group B includes cement in tons.

If the two variables are related, a close approximation to a straight line will be expected. Where ports differ markedly from the expected values, highly localised commodities are sufficiently important to produce a deviation from a straight line.

The resulting diagram (Fig. 43) shows a linear relationship. In other words, the changes in the select group of commodities accounted for the variations in import tonnage between 1950-61. There are, however, four deviations - Auckland, Wellington, Lyttelton and Otago - from the straight line. The deviations did not have a common basis as the causes were highly localised. Auckland's deviation was due to a sharp increase in the import of high grade Australian coal for metallurgical purposes and a rise in the import of softwoods, wines and sugar\(^5\) to satisfy the growing needs of the local and national population. In contrast, Wellington's deviation was largely due to the cessation of coal imports from Australia, with the switchover to electricity by manufacturers and domestic consumers.\(^6\) Lyttelton's deviation was due to a slight rise in softwood, imports in response to the expansion of building activity in Canterbury and the development of a new trade in hemp, linen and flax as locally grown varieties were insufficient to meet manufacturers' needs. Similar increases in hemp, linen, flax and softwoods were responsible for Otago's deviation. The deviations at these four ports reflected their role

\(^5\) Auckland imports the raw materials for the Chelsea refinery which is the only producing unit in the Dominion.

\(^6\) Coal imports at Wellington had amounted to 26,000 tons in 1950.
as metropolitan centres which require a wider variety of goods than other ports. It is, therefore, not surprising that the changes in a select but limited group of commodities do not adequately express the changes in their imports.

This analysis of the variations in imports between 1950-61 reveals that no single factor is sufficient in itself to account for the changes. Imports appear to be sensitive to a wide range of factors. Even a fiat of an individual firm can have important and far reaching effects on the import tonnage. The dynamic reaction of imports to such a random factor contrasts very strongly to that of population (in normal peace time conditions), which responds only slowly to a wide range of factors. This differing response of imports and population to change would account for the degree of disharmony between the two variables. Any future observations of the changes in tonnage must take the mobile character of imports into account.

EXPORTS

The diffusion of imports on a wider range of ports between 1950-61 was closely paralleled by an increase in the number of ports handling exports. Twelve ports exported 1.2m. tons in 1950, whereas 16 ports dealt with 1.9m. tons in 1961. The dispersion of exports was emphasised by striking variation in the tonnage of individual ports (Table XLVI), which differed widely from the pattern of classes and rankings in the overseas tonnage scale for 1950 (Fig.32). Indeed, the greatest absolute increase was at Tauranga, which had ranked eighteen on the scale. The growth at Tauranga was so phenomenal that the absolute increase in tonnage was over four times greater than for its nearest rival, New Plymouth. Auckland, the primate port, had only the third largest increase in exports. Nelson, Bluff and Napier also had impressive gains, but the increases at Timaru, Bay of Islands, Otago, Gisborne and Picton were more modest. Jacksons Bay was the only other port to record an increase. The decrease in absolute tonnage at Onehunga and Oamaru was very small, but at Wellington it was most striking. Thus, the changes in export tonnage between 1950-61 varied widely between ports.

Changes in Concentration

However, the variations in absolute tonnage do not reveal the changes in concentration between ports. This is obtained by comparing the difference between the actual tonnage of a port in 1961 with hypothetical figures showing
what the level of tonnage would have been if the port had grown at the national rate between 1950 and 1961. The resulting statistics (Fig.44, Table XLVI) reveal that only Tauranga, New Plymouth and Greymouth, of the ports exporting cargo in 1950, recorded gains. Bay of Islands, Gisborne, Picton, Nelson and Jacksons Bay all showed gains, but they had not handled exports in 1950. So concentrated had been the gains on the foregoing ports that the remaining ports all showed losses. The greatest losses were at Auckland, Wellington and Lyttelton. In contrast, the other losses at Napier, Timaru, Otago and Bluff were modest. Onehunga was the only other port to record a loss, but no overseas cargo was handled at the port in 1961. The export cargo was so widely diffused (Fig.44) that the share of the total trade handled by the first four ports fell from almost 76 per cent in 1950 to less than 64 per cent in 1961. 

**Explanatory Variables**

As with the examination of imports, the attempt to interpret the variations in exports is handicapped by the shortcomings of available data. For example, some companies refuse under the disclosure rule to provide information for establishing patterns of circulation within an industry. Yet, the problem is not as acute as with imports, because exports are controlled by central bodies which are, in some cases, willing to supply statistical data. From the information it is possible to identify certain factors which seem, on intuitive grounds, to be associated with the variations in exports. However, unlike imports, there is no common factor, such as population, affecting all ports. Indeed, there appear to be two sets of factors: first, those which affect most ports and secondly others which are highly localised in their effect in that they influenced only a limited number of ports. The general factors are

(i). changes in the boundaries and productivity of hinterlands defined for pastoral produce.

and the specific factors

(ii). the development of exotic forest resources.

(iii). the accelerated development of apple and pear production.

(iv). changes in the demands of a port's foreland.


58 The New Zealand Meat Producers Board, the New Zealand Dairy Production and Marketing Board, the Wool Commission and the New Zealand Apple and Pear Marketing Board.
In formulating the variables, a high degree of generalisation is involved as in detail: the character of the exports of individual ports differ markedly from one another, reflecting the adjustment of their hinterland products to the natural and acquired advantages of its situation. Each of the factors is examined in turn to assess its contribution to the changes in the exports of individual ports.

The General Factors

(i). Changes in the boundaries and productivity of hinterlands defined for pastoral produce:-

(A). Boundary changes:— It appears that the decentralization of shipping had its greatest impact on the tonnage of pastoral produce, which provided the bulk of the exports in 1950 and 1961. 59 (Tables XLII and XLVIII). The re-opening of certain ports to overseas shipping disturbed the hinterland boundaries, defined for pastoral commodities in 1950 60 (Fig.45). As all ports were not equally affected by the disturbance, it resulted in marked variations in tonnage handled by individual ports.

The extension of facilities at Tauranga and the re-opening of Bay of Islands, Gisborne, Nelson and Picton had its greatest impact on the North Island ports of Auckland, Napier and Wellington. Auckland was particularly affected by the re-opening of the Bay of Islands as meat and dairy produce from Northland had previously been brought by rail and coastal ship for export (Table XLIX). The port had also been affected, but less severely, by the attempt to develop Tauranga as a port for the export of wool and dairy produce. The threat from Tauranga, however, had not fully materialised as only a small proportion of the pastoral produce from the Bay of Plenty had been diverted away from Auckland and through the port (Table XLIX). Similarly, the re-opening of Gisborne had very little effect on Auckland, except to capture butter which had hitherto been sent by coastal ship from Opotiki. But the return of

59 New Zealand's reliance on grassland farming for her exports is underestimated by the cargo tonnage figures as the pastoral products comprised 95.7 per cent of the total value of exports in 1950 and 92.6 per cent in 1961. See New Zealand Official Yearbook, 1963, p.658.
60 The boundaries were defined on the movement of primary produce which was derived from information provided by the New Zealand Meat Producers Board, the Meat and Wool Boards' Economic Service, the New Zealand Dairy Board and the Wool Commission.
overseas shipping had a far greater impact on Napier as it deprived the port of frozen meat, dairy produce and wool, which had hitherto been brought by rail and coastal ship (Table XLIX). The impact of Napier's loss, however, far greater than the combined effect of the re-opening of Picton and Nelson on Wellington as their aggregate tonnage was very small (Table XLIX). Thus, the changes in tonnage due to the alteration of hinterland boundaries, to accommodate the re-opening of ports, had varied widely between ports.

The alterations produced by the re-opening of ports were not the only factors involved in the disturbance of the hinterland boundaries as further adjustments resulted from reversals in the flow of pastoral produce between ports already established in 1950. However, with the exception of Wellington, the reversals in flow affected a set of ports different from those affected by the re-opening of certain ports (Table XLIX).

A cogent factor in the reversals in flow was the change in the shipping agreement between the Conference Lines and the producer boards. The general arrangement for the ports which were closed under the centralization of shipping during the War was that the shipper paid the charges he would have incurred had the overseas vessels continued to load at the port concerned. Any extra costs, through road, rail or shipping to another loading port, became part of the shipping freight rates and were paid by the British Government when the meat was sold f.o.b. under a bulk purchase agreement. After the cessation of the bulk purchase agreements in 1954, the extra costs of centralization continued to be part of the general shipping freight rates affecting every meat producer. In 1957, an agreement between the Producer Boards and the Conference Lines provided for the extra costs to be borne by the freezing companies and not, as hitherto, by the shipping companies. If the freezing companies affected were not already shipping their produce through the nearest port, there was a reversal of flow to the nearest port, which offered savings in railway freight rates.61

In the North Island, New Plymouth and Wellington were most affected by the reversals in the established flow of pastoral produce (Table XLIX). With the change in the shipping policy, a marginal freight advantage was

61 Information supplied by the Meat Producers Board, Wellington.
sufficient for the Imlay freezing works at Wanganui to switch from Wellington to New Plymouth for the exportation of its meat. Fortunately for Wellington, the advantage was not sufficient to direct much wool from the Wanganui sales through New Plymouth. However, New Plymouth gained further at Wellington's expense with the cessation of the coastal shipments of dairy produce from Patea to Wellington as the subsidy paid by the Conference Lines, to ensure that their ships obtained sufficient "bottom cargo", was terminated. This resulted in dairy produce from Patea being exported through New Plymouth which enjoyed a considerable rail freight rate advantage over Wellington. The reversals in cargo flow proved far more serious to Wellington than the losses from the re-opening of Picton and Nelson (Table XLIX).

In contrast, the changes in flow between South Island ports were not as clear-cut. Indeed, the variation in flow between Lyttelton and Timaru hinged on a particular freezing works which was located almost astride the break-even point between the two ports. By 1950, almost all of the meat from the works, which had been exported through Lyttelton during the war, had reverted to Timaru. There was, therefore, no positive control over the flow of produce from the works to any specified port. Timaru had, however, handled the bulk of the produce. But in 1961 there had been a partial reversal in flow in favour of Lyttelton (Table XLIX).

Timaru had recouped any losses to Lyttelton at the expense of Otago. During the war, Otago had handled the produce which had previously been shipped through Oamaru. With the termination of the shipping companies' subsidy, the produce was switched to Timaru as it enjoyed a rail freight rate advantage over Otago at Pukeuri freezing works, near Oamaru.

Otago's loss to Timaru was further accentuated by the re-opening of a new freezing works in Southland in 1960. Prior to the opening, stock, which could not be handled by existing works in Southland, had passed through the South Otago works and been exported through Otago. The new works cut off

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62 The Wairarapa dairy companies were able to supply sufficient cheese and butter to provide heavy bottom cargo. The bottom cargo was necessary to maintain the stability of the ship as meat and wool were light cargoes.

63 Information supplied by the Canterbury Frozen Meat Co. Ltd., Christchurch. An official of the Company estimated that 88 per cent of the meat from their Fairfield Works in Ashburton passed through Timaru in 1961. The remaining 12 per cent was shipped through Lyttelton.
this supply to the South Otago works. Indeed, it boosted Bluff's exports further by drawing South Otago stock to Southland works. The gain to Bluff was emphasised by the completion of new berthing and facilities at the port. These facilities successfully curtailed the movement of export produce to Otago when unloading was hindered either at the peak of the season or during periods of inclement weather.

The cumulative effect of the reversals in flow was to favour one established port at the expense of another. In contrast, the re-opening of ports did not favour any of the established ports as it deprived them of traffic they had previously handled.

(b). Changes in productivity:- If the number of ports had remained constant, and their hinterland boundaries intact, the variations in the exports of pastoral produce between 1950 and 1961 would have been expected to reflect the changes in the productivity of each individual hinterland, expressed in terms of livestock units. Indeed, scatter diagrams reveal a close relationship between the two variables in 1950 and 1961 (Fig.45AB). The high correlation was probably due to the practice of exporting the relatively bulky produce through the nearest port.

Yet, complete association between the two variables cannot be expected as there is evidence that the pastoral produce is not always exported through the nearest port. As the relationship between livestock units and the tonnage of pastoral produce offers a valuable tool for predicting tonnages, a more detailed examination of the movement of pastoral produce away from the nearest port appears warranted.

(a). Factors diverting the flow of exports from the nearest port:- The flow of export goods to the nearest port between 1950-61 was disturbed by one or more of the following conditions:-

(1). The movement of stock:- The logical pattern of stock moving to the nearest processing plant, to be exported through the nearest port, was distorted by buying competition between individual firms, the payment of transport cost differentials, the personal

Frozen meat, butter, cheese, preserved meat, hides, skins, tallow, milk products and wool make up the pastoral produce exports.

Farmers paid the cost of transporting their stock to the nearest port works. Any use of alternative processing plants was paid by the individual company concerned.
preferences and contacts of individual farmers, the availability of killing space and the interchange of stock between different works of the same company. It is estimated, from sample studies undertaken by the Meat and Wool Boards' Economic Service, that 25 per cent of the farmers do not send their stock to the nearest works. In terms of port hinterlands, it is considered that there was a five per cent movement of stock away from the nearest port.

(2). The nature of the commodity:
Wool, tallow and skins do not require insulated wagons and refrigerated space, as do frozen meat and dairy produce. The need for non-perishable produce to pass through the nearest port was not as great as for perishable cargo. This characteristic permitted a greater flexibility in the marketing and shipping of non-perishable commodities. For instance, most of the wool was sent to sight selling centres before being despatched overseas. The concentration of wool reacted to the advantage of the seven ports serving the sales. Although the remaining ports exported small quantities of slip wool direct to the London sales, the greater part of their wool was forwarded by the internal transport network to the wool selling centre in another port's hinterland. Even within the hinterlands served by the ports serving the sales there was considerable movement between port regions, in response to sale dates, shifting transport advantages, the policies of particular stock firms and different qualities of wool. The result of the movements of wool was that the nearest port was often by-passed.

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66 The shortage of killing space at a particular time in the season has been the cause of movement of stock from the nearest works and port. See New Zealand Meat and Wool Boards' Economic Service, Sheep Farming in Central Otago 1959-60, Bulletin No.10, 1961, Table xiv, p.17.

67 During seasonal lulls or peaks, freezing companies which own two or more plants in various areas will move stock when there are marked regional variations. The New Zealand Refrigerating Co. Ltd with plants at Picton, Islington (Christchurch), Smithfield (Timaru) and Burnside (Otago) organises the interchange of stock at peak periods to keep all works as near full capacity as possible.


69 Estimate supplied by the Meat and Wool Boards' Economic Service.

70 The selling centres were Auckland, Wellington, Napier, Wanganui, Christchurch, Timaru, Dunedin and Invercargill.

71 Most of the wool from the Wanganui sale was exported from Wellington as the local port was too shallow for overseas ships to call and load.

72 In protest at not being allowed a sale a considerable proportion of wool from Gisborne is exported direct for sale in London. It is claimed, however, that neither Gisborne nor any of the remaining ports has sufficient wool to justify a sale.
(3). Port facilities:- As exports of pastoral produce can be handled adequately by ship's gear, there has been no necessity to load at a port with shed space or fixed installations. There is little evidence of the facilities of one port attracting exports from another port, with the exception of bulk tallow which has to go to ports with suitable loading equipment.

(4). The shipping companies:- Shipping companies interfered in the flow of commodities to the nearest port if the cargo was insufficient to warrant a direct call. It was often cheaper to transfer cargo to an alternative port than to make a direct visit.\(^74\) Again, during times of severe competition shipping companies interfere in the flow of exports to safeguard their interests. During the recent "freight war" between the British and the Dutch Lines, wool was transferred from Napier to New Plymouth to meet a particular sailing. Any widespread adoption of this procedure would destroy the concept of hinterlands.

(5). The final port of departure:- If cargo was shut out at the last port of call, it was often forwarded by land transport at the shipowners' expense, rather than held for the next available ship. The list of departures for 1950 and 1961 (Table L) does not form a valid criterion of the importance of the last port of call as no distinction was made between tramp and liner sailings.\(^75\) Tauranga's importance as a last port of call was rather illusory as a large proportion of the ships leaving the port were small Japanese tramp ships carrying logs. A better guide was

\(^73\)Invercargill is not a fine wool selling centre. Any fine wool in Bluff's hinterland is handled at the Dunedin sales and exported through Otago.

\(^74\)The accountants of the Conference Lines have estimated that a day in port for a cargo ship of the type employed in the New Zealand trade costs about £1,000 a day, including provisions for depreciation and replacement and after making allowances for a return of capital invested. See Producers Boards' Shipping Utilisation Committee, New Zealand and New Zealand Trade Streamlining Committee London, New Zealand Overseas Trade Report on Shipping Ports, Transport and Other Services, London, 1964, pp.10-41.

\(^75\)The principal distinction between the liner traffic and the tramp vessel traffic lies in the regularity of the service; the liner sails at a previously advertised schedule of ports and times whilst the tramp has no fixed schedule and always seeks those ports where profitable cargo is available.
the Conference Lines' designation of Auckland, Wellington, Lyttelton, Otago (Fort Chalmers) and, to a lesser extent, Bluff as the last ports of call for their refrigerated liner sailings.\textsuperscript{76} It resulted in the selected ports being able to draw cargo from other port hinterlands. The pattern of loading of the Conference Lines was also influenced by two other factors: first, the need to load refrigerated ships at ports providing bottom cargoes of butter and cheese and secondly, the need to provide a direct service for the wool sales as wool was generally loaded on the first ship sailing to the required destination. The effect of the programming of liner sailings had a direct impact on New Plymouth as the need for bottom cargo gave it a high proportion of the last discharges of general cargo in New Zealand and the first loadings of export produce. It was, therefore, very difficult to develop a wool trade at New Plymouth as the port had insufficient final sailings. If a better service was desired by the exporter than the one provided at the nearest port, he would have to choose a port with more direct services and pay the extra costs of forwarding the cargo.

(6). Railway wagons:- The New Zealand railways interfered with the free flow of traffic to the nearest port when railway wagons were in short supply at the height of the export season. For example, when wagons were required at Lyttelton for unloading they were diverted from Timaru, full of export cargo. This practice stresses the advantage of ports with a large import trade, in attracting export cargo from other ports.

The aggregate effect of the diversion of cargo from the nearest port resulted in certain ports gaining advantages over others. However, the not impact was as far reaching as the diversion of imports from the nearest port because there was less opportunity for the long distance transfer of export commodities on a comparable scale. Indeed, it is estimated that the deflection of cargo from the nearest port accounted for only about ten per cent of the total pastoral exports.\textsuperscript{77} In view of the relatively small diversion of cargo

\textsuperscript{76} Bay of Islands, Napier, Whangarei, Tauranga, Timaru, Nelson and New Plymouth were not used for final loadings. Information supplied by the Overseas Shipowners' Committee, Wellington.

\textsuperscript{77} Information provided by the Meat and Wool Boards' Economic Service, Wellington.
from the nearest port, it appears that the high correlation between livestock units and pastoral produce would provide a useful basis for interpreting variations in pastoral tonnage.

However, the specific use of the technique in interpreting the changes in the tonnage of pastoral produce between 1950 and 1961 was severely restricted by radical alterations in the hinterland boundaries. Any attempt to explain the variations in pastoral produce between 1950 and 1961, solely in terms of the changes in livestock units, was unsatisfactory.

Yet, if one accepted the assumption that the tonnage of pastoral exports was related to the number of livestock units in a port's hinterland, it would be possible to obtain a crude estimate of the contribution made by changes in productivity to the variations in the tonnage of pastoral produce. As there is no other alternative, the livestock units are calculated for the port hinterlands in 1950 and 1961 according to the boundaries defined in 1961 (Table LI).

The results reveal that the increased productivity realised with improved farm techniques, the application of aerial topdressing and bringing into production areas previously branded as "problem areas," was widespread. The changes in productivity did, however, differ widely between individual hinterlands. It was clear that New Plymouth, Wellington and Gisborne had not increased as fast as the other ports (Table LI). The very small increase at Gisborne reflects the reversion that has occurred on the East Coast as land previously farmed by Europeans has returned to the Maori farmers. In contrast, Wellington and New Plymouth lagged behind the other ports because their hinterlands were relatively well developed and did not offer the same.

Only a crude estimate could be obtained from the procedure as no account was taken of the following factors:

(i) the differential killing rate between store and fatstock areas (in 1961 the average rate of cattle killed was 12/14 per cent for store areas and 35 per cent for stock areas).
(ii) the changes in weight of the sheep population from an average of 60lb. in 1950 to 50lb. in 1961.
(iii) the regional differences in slaughtering for home consumption.
(iv) the amount of produce held in storage.
(v) the movement of stock from the nearest port.
(vi) the amount of dairy produce consumed locally.

There were, however, compensatory factors offsetting the effect of the individual factors. For instance, the quickening of the slaughtering cycle for sheep from 7 to 5½/6 years compensated for the loss in weight.
opportunities for a parallel expansion in livestock units. The increases at Picton, Bay of Islands and Lyttelton were more marked, but even they were outstripped by the faster growth rates at Bluff, Otago, Auckland, Napier and Timaru. Thus, on the basis of the differential movements in productivity, it is assumed that the greater increases in tonnage would be where sharp rises in livestock units are recorded.

(C). The effects of boundary and hinterland changes:— As the changes do not take into account alterations in hinterland boundaries, the next step is to determine the relative contributions of the two variables to the total variation in the pastoral exports of individual ports between 1950-61. As there is an estimated tonnage for the adjustments in hinterland boundaries available, the respective contribution of the two variables can be derived from excluding the estimated tonnage from consideration by using the formula:—

\[ a - b = c \]

where \( a \) = actual tonnage change in pastoral products 1950-61, 
\( b \) = estimated tonnage change for adjustments in hinterland boundaries 1950-61, 
\( c \) = tonnage change (excluding influence of boundary changes).

After excluding the effect of boundary changes, one would expect a close relationship between the tonnage change \( (c) \) and the variations of productivity, expressed in livestock units, when the two variables are plotted on a scatter diagram.

The resulting diagram (Fig.46C) shows, with certain exceptions, a high correlation between the tonnage not accounted for by boundary adjustments and the changes in livestock units. Indeed, it suggests that if the hinterland boundaries remained constant the livestock units of a port's hinterland would provide a useful means of estimating changes in the tonnage of pastoral exports.

There are, however, marked variations from the anticipated relationship, involving Otago, Bluff, Lyttelton and Timaru. The variations could be attributed partly to the difficulty of obtaining a reliable estimate of the tonnage changes (owing to hinterland adjustments), partly to the overestimation of the potential export tonnage of the four ports by the livestock units as a significant proportion of their areas were devoted to store stock, and partly
to the movement of stock away from the nearest port.\textsuperscript{79} No satisfactory adjustment can be made as it is not possible, from the available data, to measure the extent of the three factors.

It appears, allowing for the inherent crudeness of the techniques, that the changes in productivity and hinterland boundaries had not affected all ports equally (Table LII). Auckland, Napier, Wellington and, to a lesser extent, Otago had suffered losses from the adjustment of hinterland boundaries, but only at Wellington were they sufficient to offset the gain from increased productivity. In contrast, New Plymouth, Bluff, Timaru and Lyttelton benefitted not only from substantial increases in production but also from favourable adjustments of hinterland boundaries. Indeed, New Plymouth's gain from boundary changes outstripped the increase from changes in productivity. All of the newly opened ports benefitted from increases in production, but the bulk of the tonnage was derived from the ports operating in 1950.

From the foregoing analysis, it appears that the variations in pastoral exports at individual ports between 1950-61 were primarily the result of boundary changes, variations in the pastoral productivity of the port hinterlands and the movement of produce away from the nearest port. But the techniques available provided only a crude estimate of their contribution to the total variations in pastoral exports between 1950 and 1961.

\textbf{Specific Factors}

The effect of the changes in pastoral produce appears to be so widespread that, allowing for compensatory changes, they accounted for a high proportion of the variations in the total exports at individual ports between 1950-61 (Fig. 47). However, it does not account fully for all changes. In particular, other factors are clearly involved at Tauranga, Nelson, Napier and Auckland, which are highly localised in character. As they are specific to certain ports they are examined separately.

(ii). The development of the exotic forest resources:— The impact of the development of the exotic forest resources on the variation in exports stands out in sharp contrast to the changes in pastoral produce. It is

\textsuperscript{79} The movement of stock from the nearest port could have been greater on the east coast of the South Island as there were no confining physical barriers preventing the interchange of stock between ports.
characterised by phenomenal growth over a comparatively short period of time and by its highly localised effect on seaports. As the exploitation of the maturing exotic forest resources (chiefly P. radiata) was confined almost entirely to the central North Island, its spectacular growth has benefitted Tauranga. The port has been extended specifically to cater for the exports of logs, sawn timber, wood pulp, paper and newsprint, derived from the newly established industries. As the export tonnage produced by the new developments was so great, Tauranga emerged rapidly from comparative obscurity in 1950 to become the second largest export port by 1961. (Table XLVI.).

As Auckland was too distant to compete successfully for bulky commodities, Tauranga enjoyed a virtual monopoly of the export of wood pulp (Table LIII(2)), paper and newsprint (Table LIII(3)). However, the position of Tauranga in the export of softwoods (Table LIII(1)) is more complicated, for no distinction is made in the statistics between the exports of indigenous and exotic timber. In 1950, however, it could safely be assumed that most of the timber exported was derived from the diminishing indigenous resources. But in 1961 it was clear that the indigenous timber had been superseded by the exotic timbers in the export of softwoods. Situated favourably in relation to the exotic resources, Tauranga handled the largest proportion of the trade. Nelson was the only other port that was important in the trade in 1961, but the port's hinterland did not have sufficient resources for exports on a scale comparable with Tauranga. The effect of the development on the exotic timber resources is, therefore, very selective in its impact on the variations in export tonnage, as it affects only Nelson and Tauranga.

(iii). The accelerated development of apple and pear production:
The marked development of the apple and pear industry, resulting primarily from the increased productivity of existing orchards, had similar effects on the variations in exports and the expansion in timber production, for its main

80 Three of the five pulp and paper plants were established after the second World War. They were New Zealand Forest Products, Kinleith 1954, Tasman Pulp and Paper Co., Kawerau 1955 and Caxton Pulp and Paper Co., Kawerau 1956. The other two plants were at Mataura established in 1905 and Whakatane in 1939. The Mataura and Whakatane plants were originally established to serve the domestic market.

impact was concentrated on a narrow range of ports (Table LIV). Yet, it differed from the growth of timber exports in that no port was of comparable importance to Tauranga. Even the dominance exerted by Napier and Wellington - the transhipment port for Nelson - in 1950, had been dissipated by 1961 with the emergence of new outlets for fresh fruit at Nelson, Picton, Otago and New Plymouth (Table LIV). In particular, the position of Wellington and Napier had been usurped by Nelson, which had been re-opened to overseas shipping in 1950. Wellington suffered most as two-thirds of the fruit from the Nelson district was exported direct in 1961. Yet, Wellington did not lose all of the transhipment trade as there was a limit on direct shipping from Nelson, partly because of lower quantities of fruit, early and late in the season, as small consignments for specific countries outside ordinary shipping routes were more economically shipped from Wellington and particularly because the provision of only one overseas wharf was inadequate at the height of the season. 82 Although less directly affected by the re-opening of Nelson, Napier recorded a relative decrease as the rising productivity of the Hawke's Bay apple and pear orchards had not kept pace with the expansion of the Nelson district. Yet, the fruit from the Hawke's Bay district, shipped out via Auckland for the Pacific Islands, showed a slight relative increase. It was, however, small in comparison with the main changes in tonnage at Nelson, Wellington and Napier (Table LIV).

The variations in the export tonnage, not covered by the changes in fresh fruit, timber and pastoral exports, are too small and insignificant to warrant special treatment. A sharp decline in oil exports at Wellington is the only exception. It followed from the improved fuel consumption and greater storage capacity of ships between 1950-61, which reduced the necessity for ships to use the bunkering facilities at the port. 83 Apart from this exception, the variations in export tonnage are confined to a narrow range of commodities.
(iv). Changes in the demands of a port's foreland:- The development of a new range of exports, such as fresh fruit and timber products, which are concentrated on a limited range of ports, makes the export tonnage of individual ports more sensitive to changes from variations in their forelands. In 1950, the bulk of the export trade was composed of pastoral produce. Under the bulk purchase agreement in operation almost all of the pastoral produce was sent to the United Kingdom (Table LV). Thus, every port handling pastoral production served virtually the same foreland. As the products were diffused throughout the range of ports, with the exception of dairy produce (Table LVI), any variations in the forelands of ports were reflected by all ports. There is little evidence for 1950 that any port was specifically influenced by a change in its foreland. Even the expansion in the number of forelands for pastoral produce between 1950-61 had little effect on individual ports. Except for dairy produce, the individual commodities were not concentrated on any one port (Table LVI).

In sharp contrast, the new products developed between 1950-61 were concentrated on a narrow range of ports serving specific markets. Any variations in the overseas forelands of the new commodities were reflected only by the ports concerned. For example, the sudden fall off in the log trade between New Zealand and Japan, resulting from the increased freight rates and handling charges, affected only Nelson and Tauranga. The development of the new commodities has, therefore, made the tonnages handled by individual ports more susceptible to variations in their specialised forelands than has the widening of the markets for pastoral produce.

The aggregate effect of the specific factors was virtually confined to Nelson, Tauranga, Wellington and Napier. In contrast, the general factors affected all ports as each was influenced, in varying degrees, by the dispersion of overseas shipping and the changes in pastoral production. It appears, therefore, that the changes in exports between 1950-61 were primarily the cumulative result of the variations in a narrow but expanding range of commodities. The broadening of the relatively simple economic base of the

84 Forelands are the land areas which lie on the seaward side of a port, beyond maritime space, and with which the port is connected by ocean carriers. See Weigend, G.C.: Geogr. Rev. 48, pp.195-8.
country, which resulted from the new activities, makes individual ports more susceptible to random variations in highly localised commodities.

The Effect of the Comprehensive and Sectional Factors

In detail, the imports and exports of individual ports showed marked variations between 1950-61 as they responded to different stimuli which affected only one or other of the two components. Yet the effect produced by the sectional factors was broadly similar as they were all set within the framework provided by the decentralization of shipping on a wider range of ports. Thus, the dissipation of the exports of pastoral produce reinforced the diffusion of bulky imports. The cumulative effect of the sectional and comprehensive factors between 1950-61 was to produce a marked dispersion of overseas cargo away from the ports serving the metropolitan centres to the provincial ports.

However, the dispersion of overseas cargo did little to weaken the extreme imbalance characteristic of the overseas trade of New Zealand ports. Indeed, the number of ports with over 80 per cent of their trade in one direction increased from six in 1950 to ten in 1961 (Table LVII). The traditional dependence on imports was intensified at three of the ports serving the metropolitan areas. With the change in emphasis to handling bulky goods, Napier and Bluff experienced reversals in flow from having a surplus of exports in 1950 to an excess of imports in 1961. By way of contrast, Tauranga and Nelson with less than 50 per cent of their trade in one direction in 1961 were the only ports to have a relatively balanced flow in either 1950 or 1961.

In view of the characteristic imbalance of the overseas traffic flows of New Zealand ports it is not possible to make full economic use of the transportation facilities, both of land and sea, which serve the port. Any attempt to concentrate overseas cargo on a limited number of ports will have to take this critical factor into account.

In 1950 there were 33 ports engaged in the coastal trade. They handled collectively 3.8m. tons, which accounted for almost 45 per cent of the gross tonnage. There was a steady expansion in the coastal trade between 1950-61 (Table LVIII), but its growth rate was less than that of the overseas trade. By 1961, the tonnage handled had increased to 4.6m. tons,
but the trade accounted for only 36 per cent of the gross tonnage. Contrary to the overseas trade, the number of ports involved in the coastal trade had declined to 30 in 1961.

Changes in Status

When the changes in status are revealed by ranking ports according to their percentage shares of the total coastal trade in 1950, it is evident that there were marked changes in the status of ports between 1950-61 (Fig. 48, Table LIX). Five ports changed classes on the coastal tonnage scale (Fig. 48). There were also variations in rank which did not produce a change in status.

In 1950 Auckland, Wellington, Lyttelton, Westport and Greymouth may be classified, in order of importance, as grade A ports as each port contributed over five per cent of the total coastal tonnage (Fig. 48). This pattern proved temporary as there were several changes in rank by 1961. Although the three leading ports retained their grade A status, Wellington moved ahead of Auckland in the ranking. Lyttelton recorded the greatest relative increase. Westport and Greymouth, however, failed to meet the qualifying level of five per cent in 1961 and are re-classified as grade B ports. As only Whangarei moved from grade B to grade A status in 1961, the number of ports in the group declined to four and their share was reduced to less than three-fifths of the total coastal trade.

In contrast, the number and share of the grade B ports, which handled, individually, between one and five per cent of the total coastal trade, increased between 1950-61 (Fig. 48). There were ten grade B ports in 1950, handling collectively one quarter of the coastal trade. In spite of the promotion of Whangarei to grade A status, the number of grade B ports increased to 14 in 1961, with the inclusion of Taranaki,85 Greymouth, Westport and the promoted grade C ports, Tauranga and New Plymouth. The share of this enlarged group of ports rose to almost two-fifths of the total coastal trade in 1961. Within the group neither Otago nor Nelson, at the upper end of the range, improved its position. Indeed, Nelson fell from sixth to eighth place. At the lower end of the grade B range several ports showed a marked increase in their share of the coastal trade. But of these ports only

85 Taranaki serving the Golden Bay Co. Ltd. cement works is not included in the statistics for 1950.
Wanganui, Onehunga and Napier improved their rankings on the scale. Gisborne, falling from thirteenth to seventeenth position, was the only port to record a relative decline. The net result of the changes, however, was the bridging of the gap between the upper and lower range of the grade B ports in the coastal trade.

Although the promotion of Tauranga and New Plymouth to grade B status was offset by the addition of the newly opened ports of Ohiwa and Kaiapoi, the number of grade C ports - handling individually less than one per cent of the coastal trade - declined from 18 in 1950 to 12 in 1961, with the closure of Hokianga, Whakatane, Opotiki, Patea, Waitapu and Hokitika (Fig. 48). The reduction in the number of ports was accompanied by a decline in their aggregate share from over six per cent in 1950 to under four per cent in 1961. Among the grade C ports only Raglan showed strong growth. The remaining changes resulted from the birth and death of ports.

Changes in Concentration

The birth and death of ports in the official statistics complicates the pattern of negative and positive variations, which is revealed when the changes in concentration are translated into absolute terms (Fig. 49, Table LIX). Tarakohe made the greatest gain, which was rather illusory, as the statistics for the port were not revealed in the official returns in 1950. Apart from Tarakohe, the most impressive gains were at the widely scattered locations of Whangarei, Onehunga, New Plymouth, Wanganui, Napier and Lyttelton. More modest gains were recorded at Tauranga, Raglan, Picton and Timaru.

In striking contrast, the comparative losses at Auckland, Westport and Greymouth were so great that they even outstripped the gain at Tarakohe. Nelson also suffered a sharp loss, whereas more modest losses were recorded at Otago and Gisborne and the defunct ports of Whakatane, Patea and Opotiki. From the analysis it is clear that the changes in concentration did not reflect the stature of ports on the coastal scale. There must be other reasons for the negative and positive variations.

The Pattern of Analysis

In the analysis of the changes in the status of ports, the coastal trade is divided into the component elements of receipts and shipments. As the shipments of one port are the receipts of another, the changes in the status
of ports reflect certain general factors which influence the main generators of commodity movement within New Zealand. However, the expression of the factors varies between regions. As there are specific localised influences affecting ports, the changes in receipts and shipments are also examined according to the six regions defined on Figure 50. To facilitate the examination a distinction is made between

(i). the intra regional trade, involving commodities originating and terminating at ports solely within the same region.

(ii). the intra island trade, involving commodities originating in one region and terminating in another region within the same island.

(iii). the inter island trade, involving commodities originating in one island and terminating in the other island.

An examination of Shipments and Receipts

It is clear that the changes in shipments and receipts, the two component elements of the coastal trade, varied markedly between regions and ports between 1950-61 (Figs. 51 and 52 Tables LX, LXII). Shipments and receipts are, therefore, examined separately by identifying the largest comparative gains and losses.

SHIPMENTS

The initial impression from the changes in shipments is an absence of pattern, with frequent differences in sign and magnitude from the changes in the total coastal trade (Fig. 51). Close examination of the map inset and regional tabulations (Fig. 51, Table LXI) will reveal the heavy losses of the West Coast (S.I.) region and the marked gains in the Nelson, West Coast (N.I.) and East Coast (S.I.) regions. From the main portion of the map it is clear that the regional gains and losses in shipments were concentrated on a limited number of ports (Fig. 51). Thus, in the North Island, the Auckland region's main loss was recorded at Auckland and the main gains at Whangarei, Onehunga and Tauranga. Wellington recorded a substantial gain in the West Coast (N.I.) region and Wanganui a heavy loss. Trends were more mixed in the East Coast (N.I.) region and had little impact on the national pattern. In the South Island, Tarakohe had the most impressive gain in the Nelson region, whose ports exhibited almost uniformly positive behaviour. The heavy losses of the West Coast (S.I.) region were concentrated on Westport and Greymouth. The sharp gains at Lyttelton and Kaiapoi
and the loss at Otago emphasised that the changes in shipments were concentrated on a limited number of ports.

RECEIPTS

The changes in receipts differed markedly from the variations in shipments. Examination of the map inset and regional tabulations (Fig. 52, Table LXIII) shows that there was a substantial increase in the East Coast (S.I.) and a smaller one in the East Coast (N.I.) region. From the main portion of the map it is clear that, although the gains and losses were still concentrated on particular ports, there were marked differences, in sign and magnitude, between receipts and shipments of individual ports (Fig. 52). Apart from the gain at Raglan, trends were broadly similar to receipts in the Auckland region, with a heavy loss at Auckland and impressive gains at Whangarei, Onehunga and Tauranga. However, in the West Coast (N.I.) region they were the reverse, with substantial increases in receipts at New Plymouth and Wanganui and a heavy loss at Wellington. Trends in the East Coast (N.I.) region were again mixed, but Napier did record a marked positive gain. In the South Island, trends were mixed in the Nelson region, with Tarakohe showing a modest gain and Nelson a sharp loss. The changes in the West Coast (S.I.) region were uniformly negative, but the losses at all three ports were small. Although there were widespread gains in the East Coast region, they were concentrated on Lyttelton and, to a lesser extent, on Picton, Kaiapoi and Timaru. Contrary to the regional changes, however, Otago again recorded a loss. Thus, although there were marked differences in magnitude and sign between the receipts and shipments of individual ports, the changes were concentrated on a limited number of centres.

The General Factors

As the shipments of one port are the receipts of another, it appears that the changes at individual centres between 1950-61 were associated, in varying degrees, with certain general factors influencing the main generators of commodity movements in New Zealand. The main generators were

(A). the location of the main coalfields in the West Coast of the South Island.

(B). the location of the main manufacturing areas in Auckland, Wellington/Hutt, Christchurch and Dunedin.

(C). the uneven distribution of population, highly concentrated on the Auckland, Wellington, Christchurch and Dunedin metropolitan areas.
(B). the location of the principal grain growing areas in the East Coast, South Island.

(E). the location of the main fruit growing area in Nelson.

(F). the practice of shipping companies in concentrating exports and certain types of imports (high value goods in relation to their bulk) on the main ports.

Five general factors appear to affect the pattern of commodity movement between 1950-61. They are changes in:

(i). consumption.

(ii). the standard of living.

(iii). industrial production.

(iv). fuel technology.

(v). the significance of different methods of transport.

Each of the five factors is examined in turn.

(i). Changes in consumption:- The scale of commodity movements in New Zealand expanded rapidly between 1950-61, with a sharp increase in the number of consumers. In 1961 the population had reached 2.4m, having grown by a half million, or 2.2 per cent per annum, since 1950. The increase in population was reflected in a 20.22 per cent increase in the total coastal tonnage handled by New Zealand seaports between 1950-61. As the North Island population gained at a proportionately higher rate, an increased movement of goods between the two islands was generated. The differential change was reflected particularly in the increased receipts and shipments handled by Wellington, Picton and Lyttelton, the termini of the regular inter-island services. Yet, the change did not affect all commodities equally. For instance, there were increased shipments of sugar and butter from the North Island to meet the growing demand of the South Island. But the faster growth rate in the North Island did not always have a reciprocal effect in the South Island. Indeed, there was a decline in the shipment of potatoes from the South Island as there was increased production in the North Island - a trend indicative of the growing self-sufficiency of the North Island in certain commodities.

As there were differential rates of population growth within both of the main islands, the inter island changes in demand did not affect all regions (and sub-regions) equally (Table LXIV). In the North Island South Auckland/Bay of Plenty's faster growth rate increased receipts at
Tauranga and Raglan whereas Poverty Bay's slower growth rate resulted in a small decrease at Gisborne. Within the South Island the West Coast's loss was reflected in a fall in receipts at Westport and Greymouth. In contrast, the greatest increase in receipts was recorded at Lyttelton, which reflected the South Island's most rapid sub-regional population growth.

The necessity for the long distance haulage of goods has been intensified by the varying changes in population. It would not have been necessary if the changes in population had been more even, or if the population had tended to concentrate in the centre of the country.

(ii). Changes in the standard of living:— The volume and character of commodity movement within New Zealand between 1950-61 was also influenced by a general rise in the standard of living, with full employment and the absence of real poverty. As there were no wide variations in individual incomes, the rise in the standard of living was expressed in a demand for a wider range and a larger number of high quality, up to date and novelty consumer goods. The demand was reflected in a general increase in the per capita consumption of food and durable consumer goods such as refrigerators, floor polishers, drying cabinets and washing machines. In particular, the increased standard of living was recorded in a marked expansion in the shipment of motor vehicles, assembled in Wellington, Christchurch and Auckland, to all ports in New Zealand. The increased mobility brought about by the motor car boosted the receipts and shipments of Wellington and Lyttelton, as cars (accompanied by their drivers and passengers) moving between the two islands provided the bulk of the freight carried by the Inter-Island Steamer Express. Thus, although the rise in the standard of living was widespread throughout the population, it resulted in differential changes in the movement of commodities.

(iii). Changes in industrial production:— A change in the pattern of commodity movement between 1950-61 was also brought about by a steady expansion in the scope and depth of manufacturing industry, which was sustained by the

As the population of New Zealand increased by 24 per cent between 1950-61, a rise of 97 per cent in the volume of goods available resulted in an increase of 56 per cent in the volume of supply on a per capita basis. In both 1950 and 1961 two-fifths of the total supply of goods were imported. See New Zealand Official Yearbook, 1963, pp.740-6.
high level of internal demand, by a widening range of products and, to some extent, by the restrictions of imports for a short period of exchange control. The expansion was stimulated by a government policy of industrial development, aimed at substituting imported goods with locally produced commodities to save overseas exchange and to diversify an economy heavily dependent upon a small range of semi-processed primary products.  

Between 1950-61 the food group increased its volume relatively slowly, the leather industry's production fell, due to competition from imports and synthetics, while footwear, other wearing apparel and made up textile goods increased slowly, more or less in keeping with the increase in population.  

Spectacular increases in production came from new developments in the cement, rubber and the pulp and paper industries. But it was the engineering industries which contributed most to the growth of manufacturing. Improved means of distribution, the economies of large scale manufacture, and technological developments assisted the expansion of single units within particular industries. There is, for example, the merchant bar mill at Otahuhu (Auckland), the aluminium fabricating works at Wiri (Auckland), wire rope making at Auckland and the telephone cable works at Hornby (Christchurch). Other new industries were confined to a few plants, such as the pulp and paper industries of the Volcanic Plateau, or were concentrated on a number of smaller units, such as the plastics industry of Auckland-Hamilton. New demands have been created for local raw materials, such as timber and scrap metal. Imported finished goods, which would have been handled primarily by the main ports have, therefore, been replaced to some extent by imports of raw materials, which were dealt with by the port nearest to the processing plant.  

Locally produced goods were then distributed to New Zealand markets by internal transport services in which coastal shipping plays an important part.  

Commodity movements were also affected by the uneven distribution of the new developments in manufacturing between 1950-61. Unfortunately, a

88 The import content of New Zealand manufactured goods has remained high as industries using imported raw materials or semi-manufactured goods have expanded faster than those processing goods derived from indigenous raw materials.  
detailed comparison of the changes in manufacturing between different sub-regions cannot be made because no figures for individual employment districts are published for 1950-51. The statistics available do not permit an examination of the effect of the changes of agglomeration and deglomeration within the New Zealand manufacturing industries. Although there were specific instances of deglomeration reflected in the increased inter island shipments from New Plymouth and Napier, these individual cases were outweighed by a further agglomeration of industry on the metropolitan areas.

Available regional and sub-regional statistics of the added value of industrial production - recognised by statisticians as the foremost guide to the actual changes of production in New Zealand90 - show that the main gain was recorded by the North Island regions. In particular, the Auckland region obtained the greatest share of the increased production, which emphasised its dominance in the manufacturing field, the region's production being more than the total for the South Island. The increased industrial activity in the Auckland region was reflected in a rise in the shipments of manufactured goods and receipts of raw materials handled by the twin ports of Auckland-Onehunga. In contrast, the slower rate of growth in the South Island, and in the Otago sub-region in particular, resulted in a decline in shipments from Otago and Oamaru. The sub-region made only a small contribution to the "growth industries"91 such as motor vehicle assembly, rubber goods, plastics and radio assembly, which were partly responsible for the increased shipments at Auckland-Onehunga, Wellington and Lyttelton.

Although industrial progress had been rapid between 1950-61, all the developments did not result in the long distance transfer of goods either by shipping or other forms of transport. Manufacturing in New Zealand was still organized on a small scale. In both 1950-51 and 1961-62 61 per cent of the firms employed ten persons or less, a reflection of the fact that, partly as a result of geographical configuration, many firms still supply

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90 New Zealand Official Yearbook, 1963, p.507
91 Industries which have been increasing in employment and/or value added by manufacture at a rate greater than the national average.
1.33 small localised markets. The persistence of the localised pattern of manufacturing inhibited long distance commodity flows for which coastal shipping has a comparative advantage over other forms of transport.

In certain instances, the inhibiting effect was accentuated by the duplication of factory production. Firms producing consumer products in the South Island, which were poorly located in respect to the areas of new population growth, endeavoured to retain their share of the market by establishing branch plants in other parts of the country. It was reflected in the reduced shipments from Otago as many of the firms with their head offices in Dunedin opened branch plants. But few outside firms located their branch plants in Dunedin.

However, the inhibiting effects on the long distance transfer of goods were slight, compared with the traffic generated by the establishment of the new single unit enterprises. Although there was a large number of small firms employing fewer than ten persons, their contribution to the total production was only 12 per cent in 1961. Similarly, the substitution of factories did not always result in the cessation of long distance trade as there is evidence that branch factories specialised in specific lines. The net effect of the changes in the pattern of industry, was to stimulate rather than retard commodity movement within New Zealand.

(iv). Changes in fuel technology: Changes in fuel technology between 1950-61 involved a relative decline in the importance of coal as a source of energy; the contribution of hydro electric power, on the other hand, has doubled since 1950 (Table LXV). The substitution of coal for electricity, particularly in the North Island - together with increased consumption of North Island coal - resulted in a marked decline in the shipments of coal from

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93 There was little evidence of the re-location of firms or plants between 1950-61.
94 They include Ross and Glendenning (clothing), Donaghys Rope and Twine, Sargood Son and Ewen Ltd, Petrous Tiles Ltd, Austral Super Paints Ltd, Williamson Jeffrey Ltd, (stationery), St. George Co. Ltd, (canning) and Beckett and Colman Ltd, (starch and mustard). The practice of building branch factories avoids such cost producing factors as multiple handling, long hauls of small quantities and shortage of back loading.
96 Aulsebrooks Co. Ltd., a biscuit and confectionery firm, were originally established in Christchurch and bought a branch factory in Auckland. The parent and the branch firm specialise on different forms of biscuits which are interchanged between both islands.
the West Coast South Island region and in the receipts of Nelson and the three North Island regions. With the change to other forms of power, there was an increase in the shipments of imported oil products from ports with ocean terminals to ports with coastal installations. In particular, Wellington's shipments were boosted as the port served as the main distribution centre for special grades of imported motor spirit and fuel oil. Thus, the changes in fuel technology have resulted in variations in the volume and character of goods shipped between 1950-61.


(a). Changes in rail, road and air transport:- From the sparse evidence available, it appears that the increase in coastal tonnage has not kept pace with other forms of transport between 1950-61 (Table LXVI). This reflects changes in the competitive position of coastal shipping vis-à-vis other forms of transport in the three spheres of traffic operations which can be recognised in New Zealand. The three spheres are: -

(i). intra regional
(ii). intra island
(iii). inter island

Unfortunately there is no evidence available of the volume of goods moving within the three different spheres, but it can safely be assumed that the volume of cargo diminishes with distance. 97 In other words, the volume of the intra regional trade outstripped the other forms of commodity movement between 1950 and 1961. This indicates the very real effect of distance on the movement of many products, such as ubiquitous low value or bulky items like common sand, gravel, bricks or other primary "weight losing" raw materials such as logs. It also reflects the interchange of high value components used in the complex manufacturing and assembly operations. In comparison, the volume of the inter-island movement, involving multiple handling between

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different methods of transport, was least important.

Despite the variations in volume, however, it was the change in the significance of the different methods of transport, operating in the three spheres of commodity movement, that influenced the changes in receipts and shipments handled by New Zealand ports. Each of the patterns of circulation is, therefore, examined separately.

(1). Intra regional commodity movements:- For short intra regional hauls, it appears from a survey of the methods of transport used by 85 manufacturing firms that road transport especially within a 40 mile radius and rail transport, particularly outside this area, could offer speedier, more regular and, for certain goods, cheaper services than coastal shipping (Fig.53). As the combined road and rail networks extended their areas effectively to cover the whole country between 1950-61, ports which had hitherto functioned solely to provide intra regional services to areas where land routes were either poor, unavailable or longer, were deprived of all or a large proportion of their trade. Indeed, of the ports solely engaged in the intra regional trade in 1950 Hokianga, Whakatane, Opotiki and Patea had all ceased to operate by 1961. Other ports survived only by extending their functions to the intra island and inter island trade.

Yet, some forms of intra regional trade persisted as coastal shipping could compete, even for short distances, with other forms of transport for bulk freight such as cement, glass sand, lime and artificial manures, which involve no packing, no damage risk and light loading and unloading charges.

98 The Transport Licensing Regulations 1963 states: 'If there is an available route for the carriage of goods, which includes at least 40 miles of Government railway, goods shall be carried by road only in so far as it is necessary to permit of their carriage by railway.' See Dixon, R.E.: The Road Traffic Laws of New Zealand, 4th ed., Wellington, 1964, pp.450-453.

99 There is a serious lack of information on road transport in New Zealand. The reason seems to be that it is a branch of activity where there is a large number of small operators - many of them one vehicle owners - who usually do only the minimum amount of bookkeeping. It is unnecessary for a small operator to keep a daily record, year by year, of the weight and relative distance of goods carried. The big contractors (e.g. Transport Nelson Holdings Ltd) use bills of lading for each transport job, and have administration offices where all necessary calculations can be made. But even the big contractors do not always know the exact weight of goods carried because the nature of goods is such that they charge on the number of packages, or on the basis of a full truck load, which does not always mean that the truck's loading capacity is fully taken up. Thus, to obtain detailed tonnages and ton-mile figures much guesswork has still to be performed.
Indeed, there was a marked expansion in the shipments of bulk cement from Whangarei to the Auckland metropolitan area, for there was virtually direct water access to the points of the ultimate origin and consumption of the cargo. Outside the Auckland metropolitan area, however, the Portland Cement Co. Ltd. had switched to using bulk cement carriers on the railways. Thus, the role of coastal shipping was even more narrowly circumscribed in the movement of goods originating and terminating within each of the six defined regions.

(2). Intra island commodity movements:— For the intra island movements of commodities originating and terminating within the same island, it appears from the survey of the methods of transport used by New Zealand manufacturing concerns (Fig.53) that there is little competition from road transport for the longer distance hauls. But the survey shows that the railways retained their advantage over shipping as they could offer speedier and more regular services to places nearer the ultimate point of consumption, at comparable costs. The railways were, therefore, in the intra island trade able to handle not only the high value goods in relation to

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100 There are provisions in the Transport Licensing Regulations 1963 for the following exemptions to the operation of the 40 mile limit. They are

(i). where the route that includes the railway is longer by more than one-third that of the shortest route available for the carriage of goods.

(ii). where goods carried on routes or routes between terminal points authorized by licence. Some firms retained their licences when the Government brought out long distance hauliers in 1931. For example, Hooker Bros. retained the licence for transporting goods between Auckland and Tauranga.

(iii). the carriage of livestock.

(iv). the carriage of furniture and household effects when a change of residence of owner is taking place.

(v). where the axle load of the vehicles does not exceed 2½ tons gross weight. A firm in Hamilton is, therefore, able to move plastics to Auckland in a specially constructed van which does not exceed the stipulated weight.

(vi). where the following commodities are involved:

(a). perishable goods (allowed up to 75 miles)
(b). logs (allowed up to 50 miles)
(c). biscuits and confectionery (allowed up to 50 miles), except where they are specifically exempt by case law. Griffins Ltd., a biscuit firm, has successfully applied for an exemption against the railways as it was difficult for them to get their empty tins returned. As it gave them an advantage over their competitors, Aulsebrooks Ltd, Bycroft's Ltd and Cadbury, Fry and Hudson Ltd., the same facility was extended to these firms. (See Butterworth's Case Law, Case No. 1091 and 1400).
(d). the carriage of cordials and carbonated water for distribution to retailers and the carriage of empty returns (allowed up to 50 miles)

101 Coastal shipping rates for intra island commodities are equalled by the railways, but not undercut. Thus, it was cheaper to send goods by rail between the ports of Wellington and Auckland, a distance of 426 miles, than between the port of Wellington and the inland centre of Frankton, a distance of 341 miles.
weight, but also low value bulky goods. Indeed, the movement of bulky goods such as timber, coal and manures contributed 52.27 per cent of the railway freight in 1961. Coastal shipping in the intra island commodity movements was, therefore, confined to a limited range of bulky items, including cement, petroleum products, aluminium sheeting and sugar, which could be handled more cheaply than by rail. For example, almost the whole of the intra island movement of sugar within the North Island was by sea from the Dominion's sole producing plant at Chelsea, Auckland. In specific instances, however, there was an overlapping of the roles of the railways and coastal shipping. Cars from Wellington, for delivery in Auckland, were sent either by sea or by rail, to suit the convenience of the individual producer. Further, when the railway routes were circuitous, coastal shipping retained a large proportion of the high value intra island trade. For instance, as coastal shipping could offer a more direct route than the railways, the general cargo trade was well maintained between Gisborne and Auckland throughout the period 1950-61. But from the limited evidence available it did seem that the railways gained tonnage at the expense of coastal shipping, between 1950-61, by introducing specialist wagons (for carrying bulk bitumen and bulk cement) and by offering to carry cargo at "bulk freight rates". This competition was aggravated by loading and unloading delays. Only where the shipping companies introduced containers and pallets were they able to withstand the intensified competition offered by the railways. Coastal shipping, therefore, suffered a setback in the intra island trade between 1950-61.

(3). Inter island commodity movements: In contrast to the intra regional and intra island trade, the survey of the transport

103 A.J. Frankham and Co. Ltd. ceased to handle intra regional commodities within the Auckland region between 1950-61, but maintained their Gisborne-Auckland service. Indeed, their vessel was the only one equipped to handle in bulk the increased production of maize from the area.
104 Under this system firms unload and load railway trucks, carry own damages and guarantee at least 60 tons of cargo. Information supplied by Lever Bros., Petone.
105 Containers were first introduced by coastal shipping companies in 1957. In 1963, 3,700 were in use. See New Zealand Transport Department, Freight Handling, Wellington, 1964, p.40.
methods used by manufacturing firms shows that the road and railway services are complementary to coastal shipping in the inter island trade. They provide the essential door to door services between the ports and the producer and consumer. Goods of high value in relation to their weight, which are carried by road and rail transport in other spheres of traffic operations, are handled by coastal shipping in the inter island trade, in addition to the traditional bulky commodities. It is in this sphere that coastal shipping has a clear comparative cost advantage over alternative forms of transport, particularly as the bulk of the population is located close to the sea. (Table LXVII columns i and iii). Indeed, the cost advantages increase with a longer haul by sea as the freight rates for coastal shipping rise slowly with distance (Table LXVII).

Yet, it was in the inter island sphere that coastal shipping met severe competition from the airways between 1950-61. The airways, which expanded rapidly over the period, could offer speedier and more regular services than coastal shipping, particularly in conjunction with the railways in the Cook Strait Rail/Air Freight Service. But as the ton/mile cost was much higher than for other forms of transport, it was only competitive for goods with a high stowage factor such as sets, floor polishers, furniture and drying cabinets. However, the inefficiency and shortcomings of coastal shipping, such as damage in transit, pilfering and slow turn round of vessels, permitted the airways to expand their influence beyond what was considered their economic limit. In particular, it seems that the prolonged waterfront strike of 1951 accelerated the development of the airways freight service. Despite the competition of the airways, which deprived it of its

106 The Cook Strait Rail/Air Service was introduced in 1947 by the Railways Department. In 1950 the Railways Department decided to allow private enterprise the opportunity for tendering for the contract for the service. The successful tenderer was the Straits Freight Express Ltd. which took over on 1st April 1952. The service is at present maintained by five Bristol Freightaircraft on a daily basis, the number of trips varying according to the trade offering. The freight increased from 49,671,000 lb in 1952 by 73 per cent to 112,771,000 lb in 1961.

107 At one time shipping services from Bluff were so unpredictable that Mataura Paper Mills railed paper to Picton for shipment to the North Island.
high value trade, coastal shipping, particularly with the introduction of containers and pallets, retained the bulk of inter island trade between 1950-61. It was the only method with sufficient capacity to facilitate the necessary interchange of goods between the North and South Islands.

(b). Changes in the policy of overseas shipping companies:- As well as being affected by variations in the significance of internal methods of transport, the coastal trade handled by New Zealand ports between 1950-61, was also influenced by changes in overseas shipping policy. The decision of the government to re-open Bay of Islands, Gisborne, Nelson and Picton, and that of the overseas shipowners to abolish the subsidy on shipping cargo from Patea and Wanganui to Wellington to suit their convenience, had important repercussions in the function of ports in the intra regional trade. It resulted in a decline in the receipts and shipments of butter, cheese, hides, tallow and wool at a wide range of ports. The widespread impact of the change in shipping policy emphasised the importance of individual decisions on commodity movements in New Zealand.

It is clear that the changes in the competitive position of shipping in the three different spheres of traffic operation affected the volume and type of commodity carried by sea. An analysis of the individual commodities carried in the coastal trade shows the increased importance of bulk commodities, such as cement, petroleum and artificial manures (Table LXVIII). Unfortunately, the full impact of the changes cannot be gauged properly between 1950-61 as an analysis of individual commodities is made difficult by the restricted number of categories and the decision in 1955 to change the method of collecting statistics. It is apparent, however, that the strong competition of other methods of transport narrowed the range of goods handled by the ports engaged in the coastal trade and reduced their share of the increased traffic generated.

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108. The harbour authorities and shipping companies claim that the competition is unfair as ships pay harbour dues, light dues, and charges for the use of port facilities, whereas commercial aircraft competing with ships have the use of radio beams, aerodromes and other facilities, if not free, at a negligible cost. See Harbours Association of New Zealand, Notes of Conference Proceedings, 21st Conference, Wellington, 1953, p.2.

109. The Union Steam Ship Co. Ltd. estimates that up to 20 per cent of the cargo on the Inter-Island Steamer Express is carried in containers.

110. The Harbours Association estimates that the competition with the airways deprived coastal shipping of 100,000 ton.
Thus, the impact of the changes in the significance of different methods of transport and the other four general factors had an important influence of the receipts and shipments handled by New Zealand seaports.

The Regional Conditions

The analysis of the general factors shows that their effect on receipts and shipments varied between regions. Their impact on individual ports is, therefore, examined in each of the six regions, together with specific localised influences on receipts and shipments, such as the decision of the Whangarei dairy company to continue shipping butter to Auckland, rather than use the rival port of the Bay of Islands, even after the change in shipping policy.

Such localised influences, together with the regional expression of the general factors, paralleled variations in the significance of the coastal trade between differing regions, expressed in terms of per capita tonnage (Table LXIX). The changes in receipts, shipments and total coastal trade varied sharply between regions. Auckland, East Coast (N.I.) and West Coast (S.I.) recorded per capita losses in the total coastal trade, whereas West Coast (N.I.) Nelson and East Coast (S.I.) experienced varying increases. In view of the differing response, it seems pertinent to examine each region separately to account for the variations in the importance of coastal shipping in the regional traffic flows.

In interpreting the effect of the changes due to localised and general factors, the critical distinction between intra regional, intra island and inter island traffic is retained. Unfortunately, the statistics are not sufficiently refined to permit the necessary breakdown into the three spheres of traffic operations. In the absence of any other method, the change of tonnage in the three types of movement is deduced from the tonnage of receipts and shipments of individual commodities at each port and the known pattern of commodity movements supplemented by incomplete data supplied by coastal shipping companies, harbour boards¹¹¹ and individual manufacturing firms (Table LXX). With the aid of this data (Table LXX), Figures 51 and 52, and Tables LX, LXI, LXII, LXIII, LXXI, LXXII, LXXIII, the changes in the receipts and shipments at individual ports are examined within the framework of the six regions.

¹¹¹Most harbour boards do not keep records of the origin and destination of their coastal trade.
THE NORTH ISLAND

The ports in the North Island regions of Auckland, East Coast and West Coast handled in aggregate 22,000 tons more in 1961 than they would have done had they grown at the New Zealand rate between 1950-61 (Table LXXI). This gain reflected variations in the functions the ports performed in the three spheres of traffic operations (Table LXX). There was a general decline in the intra regional trade, but it was compensated by a rise in the tonnage handled in the intra island and inter island spheres.

1. THE AUCKLAND REGION

The Auckland region, in 1961, handled nearly 50,000 tons fewer than it would have handled if the ports had grown at the national rate between 1950-61 (Table LXXI). Almost the whole of the loss was sustained by Auckland, as Whangarei, Onehunga, Raglan, Tauranga and Ohia recorded impressive gains.

Shipments

The negative and positive variations in shipments paralleled the changes in the total coastal trade, as Auckland suffered a heavy loss in shipments and Whangarei, Onehunga, Raglan, Tauranga and Ohia made comparative gains between 1950-61 (Fig. 51). These differential changes reflect the decline in the intra regional movements and the increased emphasis on the intra island and inter island trade. Apart from the increased shipments of bulk cement from Whangarei to the Auckland metropolitan area, inter regional shipments were curtailed between 1950 and 1961, due to a rise in shipping costs, improvements in road communications throughout the region and the decision to extend Tauranga and re-open Whangarei, Bay of Islands and Gisborne to overseas shipping. Auckland's shipments suffered most severely from the changes as road and rail transport captured a wide range of the port's shipments and the decision to decentralize the imports of oil and fertilisers on Tauranga and Whangarei deprived the port of petroleum and fertiliser shipments. The reversal of shipping policy also resulted in dairy produce, previously sent from Mangonui, Bay of Islands, Whakatane and Opotiki to Auckland, being forwarded.

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112 Much of the intra regional traffic in the Auckland region was carried in scows. Increased costs, however, resulted in the decline of sea traffic. They became uneconomic with the obligatory increase in crew numbers from four to nine under New Zealand articles. There has, however, been a changeover from scows to barges in the intra regional trade to try and offset costs.
by road and rail transport to the newly opened ports for export.113 The changes in the intra regional trade resulted in a decline in the number of ports engaged in intra regional shipments from 11 in 1950 to five in 1961 (Table LXX).

The full impact of the contraction was not felt as there was an increase in the intra island and inter island trade (particularly with the East Coast [N.I.] region), generated by the rapid industrial development in the Auckland metropolitan area to meet the demand for a wide range of consumer goods. Yet the increase was not sufficient to compensate for Auckland's loss of intra regional shipments as a larger proportion of the commodities (paper, motor vehicles, sugar and other manufactured goods) generated by the metropolitan area were handled by Onehunga. This increased flow of goods to districts outside the region, however, was not confined to Auckland and Onehunga as there had been industrial development at other centres. Whangarei benefitted from the opening of a new glass works,114 Raglan from new engineering works in Hamilton, Tauranga from the new timber, paper and newsprint industries in the Volcanic Plateau and Chiwa from increased quantities of wood pulp from Whakatane. The new developments overcame the losses from the decline in the intra regional trade. Indeed, the ports owe their continued existence in the region's commodity movements to the expansion of their interest into spheres in which sea transport has a stronger competitive position against other forms of transport.115

Receipts

The net effect of the increased interaction with areas outside the Auckland region and the decline in the intra regional trade was reflected in the gains in receipts at Whangarei, Onehunga, Raglan and Tauranga and the loss at Auckland (Fig. 52). Yet the decline in inter regional receipts was not as pronounced as the decline in shipments (Tables LXI and LXIII). Apart from

113 The decision did not affect Whangarei - which experienced a rise in the shipments of dairy produce - as local companies refused to use the facilities of the newly opened port of the Bay of Islands.
114 Production was temporarily suspended in 1963.
115 The Northern Steam Ship Company, which had previously provided intra regional services, was reconstituted and new ships bought for the intra island and inter island services.
the three ports that were closed, the intra regional trade at the remaining ports was well maintained as they handled greater quantities of cement from Whangarei. However, Auckland again suffered a loss as the dairy produce received in 1950 was sent by rail to the nearest port in 1961.

The loss at Auckland was to some extent compensated by a marked increase in the intra island and inter island receipts. Although there was a decline in coal, flour and potato receipts - indicative of the growing self sufficiency of the region in these commodities - the ports received larger quantities of raw materials (especially grain for flour milling) and manufactured goods to meet the growing demands of the region's expanding population. However, the accelerated increase, together with the expansion of overseas trade, overtaxed Auckland's capacity to handle the goods at certain times of the year. Increased use was, therefore, made of Onehunga, Whangarei, Raglan and Tauranga to satisfy the region's increasing demand for raw materials and goods manufactured in New Zealand. Thus, the improved inter island services permitted the decentralization of the increased volume of inter island commodity movement.

The impact of the decentralization of receipts and shipments on a large number of ports at the expense of Auckland reduced the port's total share of the region's coastal trade from almost three quarters in 1950 to nearly three-fifths in 1961 (Table LXXII). Yet, in spite of the changes, there were few marked changes in the relative balance between inbound and outbound movements (Table LXXIII). Whangarei developed a more balanced trade and Tauranga's flow reversed from a marked excess of receipts in 1950 to a slight surplus of shipments in 1961. However, the regional balance remained stable in favour of receipts.

2. THE EAST COAST (N.I.) REGION

The East Coast region experienced a rate of growth slightly better than the national average between 1950-61 (Table LXXI). It was not, however, common to all ports, as Napier and Tolaga Bay recorded gains and Gisborne and Tokomaru Bay losses.

Whangarei recorded the only increase in coal receipts in the Auckland region. The expansion resulted from the cessation of coalmining in North Auckland and an increased tonnage of West Coast (S.I.) coal to meet the expanding demand of the cement works.
Shipments

This increase was not derived from shipments as the comparative losses at Gisborne and Tokomaru Bay outweighed the gains at Napier and Tolaga Bay (Fig. 51). The differing response represented the selective decline in intra regional shipments and an increased movement of commodities outside the region (Table LXX). Intra regional shipments declined with the re-opening of Gisborne to overseas shipping and the improvements in land transport. Although there was a decline in the volume of commodities with the closure of the Tokomaru Bay freezing works (1952), a large proportion of frozen meat, hides, tallow, wool and butter, shipped to Napier from Gisborne and Tokomaru Bay in 1950, was either exported direct or sent by rail and road in 1961. The total eclipse of intra regional shipments was prevented by only two factors: first, the redistribution of oil from Napier to the other regional ports and secondly, the continuation of wool shipments from Gisborne, Tokomaru Bay and, in increasing quantities, from Tolaga Bay to Napier's sales as Gisborne exported wool only direct to the London sales. Indeed, with the decline of shipment of wool and hides from Napier to Wellington, the region's shipments would have been insignificant, but for the expansion of Napier's intra island and inter island trade in wines, canned beer and vegetables, fresh fruit and light industrial goods and Gisborne's trade in grain (maize) and canned goods which, to some extent, compensated for the decline of the intra regional trade. Even so, this region generated the smallest volume of shipments of any of the six regions (Table LXI).

Receipts

In contrast to the comparative loss of shipments, there was an increase in the region's receipts (Table LXIII). The increase was concentrated highly on Napier, as Gisborne, Tokomaru Bay and Tolaga Bay recorded losses (Fig. 52). These differentials, as with shipments, reflected the decline of the intra regional trade and the increased importance of trade with areas outside the region. Intra regional receipts declined at all four ports with the improvements in road transport, but Napier suffered most as its receipts were affected also by the re-opening of Gisborne to overseas shipping (Table LXX). However, with the exception of the two Bay ports, deprived of the intra island service with Auckland, Gisborne and Napier
benefitted in varying degrees not only from an increase in inter island receipts, but also in intra island trade, as the rail link with the Auckland region to either Napier or Gisborne was circuitous. Apart from the effect of the changes in fuel technology on coal, and the region's growing self sufficiency in potatoes, both Napier and Gisborne received increased quantities of sugar, motor spirit, wines, spirits and beer (intra island), cement (inter island and intra island) and flour (inter island). Although Napier's cement receipts were boosted by cessation of overseas imports, the only difference in commodities handled from Gisborne was serpentine from Nelson. The gain at Napier, however, outstripped the increase at Gisborne. It reflected the greater population growth of Napier's hinterland compared with that of Gisborne. This difference in consumer demand was accentuated by a higher proportion of Maoris in Gisborne's hinterland. As Maori incomes were generally much lower than European, Gisborne probably did not benefit from the general increase in the standard of living as much as Napier. Improved land communications also enabled Napier to strengthen its position at the expense of Gisborne as some goods (general cargo and motor spirit) for the northern area of the East Coast were received by the port and railed north. Thus, Napier recorded a marked gain in receipts, whereas Gisborne could only maintain its position (Fig.52).

The effect of the changes in receipts and shipments between 1950-61 was to concentrate cargo on Napier, at the expense of Gisborne (Table LXXII). It also produced extreme imbalances of flow, as Napier had over 80 per cent of its trade in the inbound direction in 1961 and Tokomaru Bay and Tolaga Bay over 90 per cent in the outbound direction (Table LXXIII). As Napier's gain in receipts outstripped the other changes, the net result of the variation was for the region's balance to move in favour of inbound movements.

3. THE WEST COAST (N.I.) REGION

The West Coast recorded a comparative gain of 57,000 tons between 1950-61 (Table LXXI). Although Patea was closed (1960), Wellington, Wanganui and New Plymouth all recorded substantial gains.

Shipments

Shipments, however, varied from the regional pattern, as there were losses at Wanganui and Patea, a small gain at New Plymouth and an impressive gain at Wellington (Fig.51). The differential changes were associated with
variations in the role of ports in the three spheres of traffic operations (Table LXX). Intra regional shipments of pastoral commodities ceased at Patea and declined at New Plymouth and Wanganui, following the decision of the shipping companies (1960) to abolish the subsidy on dairy produce sent to Wellington as "bottom cargo" for overseas ships. Only at New Plymouth was the loss offset by an increase in intra regional shipments of petroleum. Variations in intra regional shipments accounted for the total changes in shipments at Wanganui and New Plymouth as their intra island and inter island trade was slight. Although the slight importance of the ports in these spheres revealed the lack of specific complementarity with other regions of New Zealand, it also reflected the commanding position of Wellington for distributing goods by sea. With a comprehensive range of shipping services, Wellington clearly increased its domination over the region's coastal shipments. The redistribution of imported petroleum products boosted commodity movements in all three spheres. But the inter island trade was the main contributor as there was increased movement of vehicular traffic and manufactured goods (imported and manufactured locally in the Hutt Valley industrial area) to the South Island. Yet, in spite of increased shipments, the Cook Strait Rail/Air service captured many of the high value goods considered to be the cream of the inter island traffic.

receipts

Air transport also captured high value goods from the South Island, but its impact on receipts was not apparent as there was a substantial increase in the region's tonnage (Table LXIII). The changes at individual ports were, however, the reverse of the variations in shipments, as New Plymouth and Wanganui recorded impressive gains, whereas Wellington experienced a comparative loss (Fig. 52). The differential changes were the net result of variations within the three spheres of traffic operations (Table LXX). Wellington's loss was due to the change in shipping policy which deprived the port of cargoes sent from smaller ports for export overseas. With the decentralization of overseas shipping on a larger number of ports, intra regional (butter and cheese), intra island (wool) and inter island cargoes (beans and peas, frozen meat, butter, cheese, fresh fruit and seeds) were exported direct. The loss at Wellington was aggravated by the regional decline in coal and potato receipts. However, the decline was arrested by a rise in intra island receipts.
of sugar and inter island receipts of cement, exotic softwoods (from Nelson), manures (serpentine) and motor vehicles. The gains at Wanganui and New Plymouth not only reflected increased inter island receipt of cement and manures, but increased tonnages of fresh fruit and a rise in the intra regional shipments of fuel oil and motor spirit. Wanganui and New Plymouth appear to have benefitted at the expense of Wellington from the decentralization of bulky commodities.

The varying changes in receipts eased slightly the concentration of the region's coastal trade on Wellington, but the port still retained over three-fifths of the tonnage (Table LXXII). They also produced extreme imbalance in the flows of Wanganui and New Plymouth as over 90 per cent of the trade was in an inbound direction in 1961 (Table LXXIII). Yet, the balance of inbound and outbound cargoes remained unchanged in favour of receipts.

Thus, the analysis of the three North Island regions does not reveal a coherent pattern of concentration in the coastal trade. Indeed, almost the whole range of possibilities was represented, from increased centralization in the East Coast region, slight decentralization in the West Coast region, to a large degree of decentralization in the Auckland region (Table LXXII). However, the cumulative result of the changes was to make the North Island ports more dependent on receipts in 1961 than they were in 1950 (Table LXXXIII).

THE SOUTH ISLAND

The ports in the Nelson, West Coast (S.I.) and East Coast (S.I.) handled collectively 22,000 tons less than they would have done if they had grown at the national rate between 1950-61 (Table LXXI). The loss reflected changes in the functions performed by ports in the three spheres of traffic operations (Table LXX). As the intra regional trade, in contrast to the North Island, was small, it had little impact on variations at individual ports. The changes were, therefore, confined to the intra island trade, which declined sharply between 1950-61, and the inter island trade, which varied between regions and even between different ports.
4. THE NELSON REGION

The Nelson region handled over 107,000 more tons than it would have done had the region grown at the national rate between 1950-61 (Table LXXI). However, the gain clearly overstated the region's position as the cement port of Tarakohe was included in the statistics in 1961 but not in 1950. The gain from this source overshadowed Motueka's small gain, Nelson's marked loss and the closure of Waitapu (1958).

Shipments

If the distorting factor of Tarakohe's cement shipments to the North Island is disregarded, the loss at Waitapu and the gains at Motueka and Nelson represent the cumulative effect of the modifications in the dual role performed by the Nelson region in generating commodities either for domestic consumption or export through Wellington (Fig.51). The extension of a full range of shipping services to Nelson resulted in a decline in the inter-island trade of fresh fruit and pastoral commodities (except wool) from the region for transshipment overseas at Wellington. As butter was the mainstay of Waitapu's trade, shipment from the port ceased. Improved connections with the area, hitherto served by Waitapu, resulted in butter being moved by road for export at Nelson. A further impetus to the use of road transport was the declaration of the Nelson-Blenheim highway as a "notional railway" (1957). It resulted in the loss of much of the intra island trade between the region and the East Coast (S.I.) as railway freight rates apply for transport between Nelson and most other South Island centres. The losses due to the "railway" and the change in shipping policy were, however, compensated at Nelson and Motueka by the expansion of specialised agricultural products (tobacco and hops) and the development of the exotic timber and manure (serpentine) trade for consumption in the North Island. But the full potential of Nelson's inter island shipments was not fully realised as certain commodities (perishable fruit and tobacco) were sent to the North Island by air.


Receipts

Competition from other forms of transport is also reflected in the marked decline in receipts at Nelson - the main regional port - and the small loss at Motueka (Fig. 52). Intra regional movements of cement from Tarakohe to Nelson ceased with the improvement of road transport, intra island movement of goods (flour) from the East Coast virtually ceased with the notional railway link119 and inter island movements were affected by competition from air transport for high value goods originating in Wellington and inland North Island centres. As air competition for the inter island trade was selective, certain commodities suited to sea transport (petroleum and wines and spirits) increased. Indeed, as intra island coal receipts from the West Coast declined sharply with the changeover to oil fuel, the inter island trade became the main inbound trade handled by Motueka and Nelson, for the region was still dependent on the North Island for locally manufactured goods and imported commodities transhipped at Wellington.

The net effect of the receipts and shipments on the region's coastal trade is distorted by the inclusion of Tarakohe. From a position of extreme dominance in 1950 - with over four-fifths of the region's trade - Nelson's share was reduced to below one half in 1961 (Table LXXII). Nelson's flow was also reversed from an excess of receipts in 1950 to a surplus of shipments in 1961 (Table LXXIII). The addition of Tarakohe, together with the reversal of flow at Nelson, gave the region a marked preponderance of shipments over receipts.

5. THE WEST COAST (S.I.) REGION

The West Coast region had a comparative loss of almost 290,000 tons between 1950-61 (Table LXXI). Almost all of the loss was sustained by Greymouth and Westport. The balance was due to the closure of Hokitika (1952).

Shipments

A decline in shipments, resulting in a heavy loss at Greymouth and Westport, was largely responsible for the region's negative result (Fig. 51). The loss was associated with the region's specialist role of providing coal and softwoods for Nelson and the North Island. A diminishing supply of indigenous softwoods for consumption outside the South Island resulted in the

119 The inward traffic was 27,870 tons in 1961. *Ibid.* p. 74.
cessation of shipping at Hokitika and reduced shipments from Greymouth and Westport. But the main reason for the tonnage losses at the latter ports was a decline in the demand for coal, with the changes in fuel technology. However, the impact affected Westport more severely than Greymouth, for the coal mined in Westport's hinterland was less suitable for gas making. Fortunately, the full effect of the fall in coal shipments at Westport was not experienced, as the decline was cushioned by the establishment of a new cement works (1957). The shipments of cement to the North Island broadened the base of Westport's trade and the region's economy. Yet, in spite of the new source of shipments, the cumulative effect of the changes was a disastrous loss in tonnage. The accelerated decline in shipments at Westport and Greymouth resulted in their becoming the problem ports of an economically retarded region, which fell from being the leading generator of cargo in 1950 to only the fourth ranking region in 1961 (Table LXI).

Receipts

The retardation of the West Coast region, inherent in the decline in shipments, was paralleled by a concurrent loss in receipts at Greymouth, Westport and Hokitika (Fig.52). Although the decline was less rapid than that of shipments, the tonnage of receipts was always very small in comparison with outbound cargoes (Table LXIII). Apart from the cessation of cement receipts from Takaka, with the opening of the Westport works, the overall loss in receipts reflected a fall in consumer demand with the region's loss of population. It was not offset by the increased demand for a wider range of goods with the general rise in the standard of living, which occurred in spite of the region's economic difficulties. Apparently the increased demand was not handled by coastal shipping but by the rail link with the East Coast and road connections with Nelson as the general cargo shipping services with Wellington and Onehunga were only on a monthly schedule. The only commodities, therefore, to show an increase were non-perishable cargoes such as beer, wines and spirits and packaged petroleum products, which were well suited to sea transport. Indeed, the loss in receipts would have been much greater but for the chronic shortage of shipping space for the inter-island movement of new cars. Firms were so desperate that they used deck space on empty colliers returning to Greymouth and had their cars railed or driven to the East Coast. Although
the receipts of cars bolstered up inbound cargoes, the tonnage received at the West Coast ports declined to less than one per cent of the national total — the lowest of any region (Table LXIII).

The changes in receipts and shipments did not react in favour of one port at the expense of another. Westport and Greymouth continued to share the region's coastal trade almost equally (Table LXXII). As the changes had done little to alter the fundamental character of the region as a shipper of raw materials, the balance between inbound and outbound movements at Westport and Greymouth remained heavily in favour of shipments (Table LXXXIII).

6. THE EAST COAST (S.I.) REGION

The East Coast region, in striking contrast to the West Coast region, had the greatest comparative gain in the 1950-61 period, a gain of 162,000 tons (Table LXXI). All ports contributed to the region's positive result, with the exception of Wairau, Otago and Half Moon Bay.

Shipments

The rise in shipments paralleled the regional pattern with a large gain at Lyttelton and a comparative loss at Otago (Fig.51). As the intraregional shipments were small, apart from the movement of petroleum products from Lyttelton, which increased slightly between 1950-61, the changes in shipments reflected variations in the region's specialist role of generating raw and processed agricultural products and other manufactured goods for consumption in the North Island and other parts of the South Island. Shipments of flour and potatoes declined with improved "rail" connections with Nelson and the increased self-sufficiency of these commodities in the North Island. The loss, however, was more than offset by a rise in shipments to the North Island of grain, cereal products and a wide variety of manufactured goods ranging from condensed milk to insulators, to meet the growing demand created by the rapid population growth. As the changes in demand did not affect all ports equally, there were differential variations in shipments between individual ports (Fig.51). The large gain at Lyttelton reflected, to some extent, the increased production of Christchurch's industries (biscuits, tyres, motor vehicles), but the main gain came from the increased movement of motor vehicles on the daily Inter Island Steamer Express. However, frequent congestion in the railway sheds prevented the port from obtaining full benefit from the
daily service. Indeed, Kaiapoi, offering direct rail access to the wharf and a frequent shuttle service to Wellington, captured a significant proportion of Lyttelton's traffic. Picton's more modest gain could also be attributed to the ports frequent shipping services with Wellington. In contrast, Timaru's modest gain was due to an expansion of flour shipments as, unlike Lyttelton and Oamaru, firms in its hinterland had not lost any quotas to the North Island.\textsuperscript{120} Otago's loss was due to two factors: first, the opening of branch factories of firms domiciled in Dunedin enabled the North Island to be served from establishments closer to the market than the parent firm and secondly, the improvement in Bluff's coastal shipping services. Cereal products from Gore, previously handled by Otago, were shipped through Bluff, with the provision of more regular services. Thus, local influences were a pertinent factor in the variations in shipments at individual ports.

**Receipts**

Although the differential growth of the two islands had produced varying reactions in shipments from the East Coast ports, it was clear that there was an increased dependence on the North Island for receipts between 1950-61, apart from petroleum products received intra regionally from Lyttelton. All ports, with the exception of Wairau (losing some of its trade to Picton), Otago and Half Moon Bay, recorded comparative gains in receipts (Fig. 52). The gains reflected a general increase in imported goods redistributed from Wellington and Auckland and locally manufactured goods from North Island ports (sugar, paper and newsprint, beer, wines and spirits and butter). The changes, except for Lyttelton's gain, were more or less in accord with the variations in population within port hinterlands. Lyttelton's greater growth was due to two factors: first, the reciprocal movement of vehicular traffic from the North Island and secondly, the daily connection with Wellington, which allows the port to serve as a distribution centre for areas beyond which it has a freight rate advantage over other ports. Paradoxically, on account of the delays between the port and Christchurch, Kaiapoi (although ships using the port are restricted by bar conditions) captured a share of the receipts destined for the metropolitan area.

\textsuperscript{120} As the Wheat Committee controls the production of flour, new firms can only be established by buying the quota of an existing firm. The two new flour mills in Tauranga bought quotas of firms in Christchurch and Oamaru and transferred them.
Those variations in shipments and receipts resulted in a slight increase in concentration at Lyttelton (Table LXXII). However, the most significant change was in the relative balance between inbound and outbound movements (Table LXXIII). The balance at all ports, except Half Moon Bay, moved in favour of receipts, but only at Picton and Wairau was there a change in flow from an excess of shipments in 1950 to a surplus of receipts in 1961. Yet, the changes were sufficient to reverse the region's balance as inbound cargoes exceeded outbound in 1961.

The analysis of the South Island regions, therefore, provides little evidence of increased concentration in the coastal trade (Table LXXII). A slight decentralization took place in the West Coast and Nelson region (if Tarakohe is disregarded), whereas there was a small increase in centralization in the East Coast region. The changes did, however, produce a more favourable balance of trade as the South Island's dependence on shipments was reduced in 1950-61 (Table LXXIII).

Changes in the status of ports in the coastal trade resulted, therefore, from their varying response to a wide variety of regional and localised factors. It is possible, however, to recognise the predominant characteristic involved in the changes at each port. The losses at Auckland and Gisborne, for example, resulted from a decline in intra regional trade, whereas Lyttelton's gain was derived from a rise in the inter island trade. At New Plymouth and Wanganui the key factor was the decentralization of bulk cargoes, but at other ports the change hinged on a single commodity. The losses at Westport and Greymouth, for instance, were due to a decline in coal cargoes while the gain at Whangarei was due to the expansion of cement production. In view of the wide variety of predominant characteristics, few generalisations can be made at the national level. Indeed, the only basis for interpreting and predicting changes in the status of ports in the coastal trade is to examine ports individually, within their regional frameworks.

**TRANSHIPMENT TONNAGE**

Variations in the transhipment trade paralleled the changes in the overseas rather than the coastal trade in that the number of ports handling cargo increased from nine to eleven. In contrast, the transhipment trade declined sharply from 444,956 tons in 1950 to 315,092 tons in 1961 - a fall of
29 per cent (Table LXXIV).

Changes in Status

Yet, in spite of the divergent changes in tonnage and the number of ports, the transhipment trade remained highly concentrated on Wellington. Although Wellington did experience an absolute loss between 1950-61, the port retained a substantial share of the transhipment trade (Fig.54, Table LXXV). Auckland, in second position, improved slightly, but Napier, the third ranking grade A transhipment port in 1950, suffered a marked decline and was reclassified as a grade C port. In 1961 both Lyttelton and Otago had moved ahead of Napier in the transhipment rankings. In comparison, the changes among the other ports were small and did not warrant detailed examination.

Changes in Concentration

Yet, when the changes in concentration are examined (Fig.55) a surprisingly large dispersion of cargo is revealed. In particular, it shows that there had been a large comparative gain at Auckland and more modest gains at Lyttelton, Otago, Nelson and New Plymouth. The gains stood out in sharp contrast to the marked comparative losses at Napier and Wellington.

Explanatory Variables

As most of the transhipments in 1950 and 1961 were goods transferred from coastal to overseas vessels and from overseas to coastal vessels121 (Table LXXVI), the most cogent factor associated with the variations in tonnage appears to be

1. the decentralization of overseas shipping on a wider range of ports.

The decentralization of overseas shipping encouraged ports to develop and improve their facilities for handling overseas ships. As more ships were attracted, it reduced the necessity for receiving or shipping goods coastwise for transhipment overseas. The practice resulted in a marked but selective decline in the volume of transhipments.

Wellington was most affected by the changes as the dispersion of

121 The virtual extension of the road network to all parts of the country had almost eliminated transhipments between coastal vessels. It survived only for goods forwarded by sea to isolated areas like the Marlborough Sounds and islands off the New Zealand coast. The transhipment of goods between overseas vessels has never been of great significance. It involved only the transfer of miscellaneous stores for the Pacific Islands.
overseas cargo over a wide range of ports had weakened its transhipment function. Frozen meat and beans and peas from Picton, cheese from Patea, frozen meat and a large proportion of the fresh fruit from Nelson, which were transhipped overseas from Wellington in 1950, were either handled direct at the ports concerned or were sent by land transport for export through another port in 1961. Similarly, the transhipments of wool and frozen meat declined sharply at Napier with the re-opening of Gisborne and the increased use of road and rail transport to bring produce from the East Coast for export overseas.

But, in contrast to Napier, Wellington’s loss was to some extent compensated by increased transhipments of petroleum products, which resulted from the selection of the port as the main distributing centre for the transhipment of special grades of oil to all ports and motor spirit to ports which did not receive their supplies direct. The increased transhipment of petroleum products at Wellington masked the decline in the delivery of imported goods to the South Island, which followed from the greater emphasis on Lyttelton as the main importing centre for the South Island and the increasing dominance of Auckland as the main distributing port for high value imports. But the slight gain Wellington made in the coastal to overseas transhipments was insufficient to offset the loss in the overseas to coastal transhipment trade.

In contrast to Wellington, Auckland was less affected by the dispersion of cargo on a wider range of ports. The port did lose a small amount of export cargo, which had hitherto been transhipped at the port, but the transhipment of imported goods persisted. Indeed, they even increased slightly as it was still feasible and economic to distribute bulky imported goods by sea to certain areas in Northland, Coromandel and the East Coast, which had poor or restricted land connections with the port. The increase in overseas to coastal transhipments at Auckland was sufficient to compensate for the small loss in the coastal to overseas transhipment. Similarly, as Otago, Lyttelton and Nelson specialised in the transhipment of bulky imports (iron and steel goods and timber) to other ports, they all recorded an increase in transhipment tonnage between 1950-61.

Thus, the selective impact of the decline in the transhipment trade at individual ports appeared to be closely associated with the type of transhipments handled. Ports engaged in transshipping exports were more affected than ports handling imports.
III. INTERPRETATION OF THE GROSS TONNAGE RANK

After analysing, in detail, the overseas, coastal and transhipment scales, we are now in a position to account for changes in the rank of ports on the gross tonnage scales between 1950-61. However, there was not a common basis to the variations between 1950-61 as the individual components exhibited differing patterns. The decentralization of overseas cargo from Auckland, Wellington and Otago was only partially reinforced in the coastal trade as Wellington recorded a small gain. In the transhipment trade the reverse was true as there was dispersion from Wellington and increased concentration at Auckland. Thus, the three components of the gross tonnage responded differently to a wide range of varying influences between 1950-61.

Indeed, it is apparent from the summary of changes between 1950-61 that variations in the rank and grade of ports on all three component scales accounted for changes in the status of ports on the gross tonnage scale (Table LXXVII). In view of the varying importance of the three components, some weighting needs to be employed. The variations in the overseas trade are generally more significant than those in the coastal trade, whereas the changes in the transhipment trade are of least importance. With this consideration in mind, it is now possible to indicate which components have contributed to the changes in the rank of ports on the gross scale between 1950-61.

Variations in all three components contributed to the changes among the major ports, which handled over five per cent of the gross tonnage (Table LXXVII). Although Wellington displaced Auckland as the leading coastal port and Lyttelton improved on its transhipment position, the changes were not sufficient to disturb the rankings of the first three ports on the gross scale. A decline in Otago's overseas ranking, however, resulted in the port's losing its major status and fourth position on the gross tonnage scale to Tauranga. There was an improvement in Tauranga's coastal ranking, but its spectacular rise in the gross tonnage rankings was derived almost entirely from the upsurge in its overseas trade. Thus, with the addition of Tauranga, the number of major ports was maintained at four.

The marked changes in the rankings of the secondary ports, handling over one per cent and under five per cent of the gross tonnage, stemmed also from variations in the ranking of ports on the three component scales (Table
LXXVII). However, the greater importance of the overseas ranking is apparent as New Plymouth failed to retain its fifth position on the gross scale, in spite of maintaining its overseas position and improving its coastal and transhipment ranking. Although Whangarei's rise in the rankings can be attributed to an improvement in the coastal trade, the rise of Bluff and Timaru on the gross scale was due to the decline in status of Westport and Greymouth rather than to positional changes on the gross scale. No secondary port moved to major status between 1950-61, but their number was augmented in 1961 by Tarakohe, unranked in 1950, and the former minor ports of Wanganui and Onehunga, which improved their overseas and coastal ranking respectively. With the addition of the former major port of Otago, the number of secondary ports was boosted from seven in 1950 to 11 in 1961.

The changes among the minor ports, handling less than one per cent of the gross tonnage, resulted primarily from variations in the coastal trade as the overseas and transhipment tonnage were handled by a limited number of ports (Table LXXVII). Indeed, the overseas and transhipment tonnages were so small that they were of marginal importance. Neither Gisborne nor Picton improved its rankings on the gross scale, in spite of improvements in overseas ranking. Bay of Islands, in contrast, with an improvement in both its overseas and coastal ranking, moved from the lower extreme to the upper range of minor ports. Such a rise is not altogether unexpected as the margins separating individual ports were small. The other changes among the minor ports were rather illusory as they were due to the high casualty rate. Six ports operating in 1950 ceased to function by 1961. Indeed, the outstanding feature of the changes among the minor ports between 1950-61 is the decline in the number of ports solely dependent on the coastal trade (Table LXXVII).

Thus, the differing response of ports to the post-war expansion of the New Zealand economy stemmed from changes in their positions on the overseas, coastal and transhipment scales. It is surprising that these changes had a far greater effect on the ranking of ports on the gross scale than did the economic upheaval of the thirties.
CONCLUSION

The development of New Zealand seaports is a complex problem. This study has sought to identify and assess the factors involved in the development of these ports by accounting for changes in their status between the initial and terminal years, for two selected periods of time. The study has shown that these changes, expressed in terms of gross tonnage, will not yield to a single factor analysis, and that it is necessary to break down the gross tonnage into its overseas, coastal and transhipment components. Each of the components is examined separately by ranking ports on three different scales, according to their overseas, coastal and transhipment tonnage in the initial and terminal years. The interpretation of the variations in the rank of ports on the component scales provides the key to accounting for changes in the status of ports on the gross scale.

As a means of describing and measuring the variations in the status of ports on the gross tonnage and component scales, the changes in the concentration of tonnage are revealed by comparing the actual tonnage of a port in the terminal year with the hypothetical tonnage of the port had it grown at the national rate during the selected period. This method of demonstrating comparative change indicates patterns of centralization and decentralization by showing which ports "gained" (increased at a rate greater than the national rate) and which "lost" (increased at a rate lower than the national average).

It is apparent, in employing the comparative approach, that concepts which are adequate for explaining the static situation of ports need to be revised or restated in accounting for changes in the individual components of the gross tonnage over a period of several years. Indeed, it is possible for a concept to be valid for one component but not in the same form for another. The classic concept of a hinterland has reality, when refined, for examining changes in imports and exports. However, the notion of a port serving a single area in which it has a freight rate advantage over other ports needs restating in terms of three hinterlands, encompassing the intra regional, intra island and inter island patterns of circulation, if it is to provide an adequate basis for interpreting the changes in the coastal trade. In the transhipment trade the hinterland concept has little application as the nodal situation of a port in respect of sea routes is the critical factor, and not the hinterland
which the port is purported to serve. The importance of such notions is that those which are accepted can become part of a conceptual framework for analysing the changes in the status of ports.

In interpreting these changes, a large number of factors have been identified. This has been necessary as the individual components have reacted independently and sensitively to a wide range of stimuli. Unlike population changes, which respond only slowly to economic influences, the chance occurrence of a random factor, such as the government decision to control grain imports, is immediately reflected in the tonnage handled by individual ports. Indeed, only after the break-down of a component into its individual commodities is it possible to discover the reasons for the changes.

The reasons advanced for these changes can be grouped conveniently into general and specific factors. General factors, which affect either all or nearly all ports, can be recognised in each component. Where changes defy generalised explanation, particularly in the coastal trade, it is necessary to invoke specific factors, each of which affects either a single or a limited number of ports. It is the occurrence of these specific factors which aggravates the problem of assessing the contribution of individual variables to the changes in the status of seaports.

In spite of these difficulties, the general and specific factors identified in this study can still be employed, given certain assumptions, in forecasting changes in the gross tonnage. By reversing the procedure of analysis and beginning with the individual commodities, it is possible to predict, from available data, the volume of the individual components. In this way a realistic estimate of the gross tonnage for a future date has been produced in Part III of the study.
PART III

SOME OBSERVATIONS ON THE FUTURE DEVELOPMENT OF

NEW ZEALAND SEAPORTS
CHAPTER VI

CHANGES IN THE STATUS OF SEAPORTS 1963-1972

This study has attempted to identify and assess the factors underlying the complex development of New Zealand ports. It is hoped that it may be of value to the effective planning of seaports, railways, road transport and coastal shipping, such as is envisaged in the proposed Royal Commission on transport.¹

The Royal Commission would undoubtedly start from the principal recommendation of the recent inquiry into New Zealand's overseas trade - the concentration of development on the ports that can provide the most efficient service for the overseas trade - and pursue the implications of this objective for internal transport.² In view of such a proposal, it seems pertinent to follow this study to its logical conclusion by suggesting what the changes in rank would be if present trends continue and scheduled plans materialise. Thus, on the basis of the analysis of past patterns of development and an appraisal of information on predicted changes in economic development, an attempt is made to construct a tentative hierarchy of ports for the period 1963-72.³

Method of constructing hierarchy

It has been demonstrated in the two analyses of the past patterns of port development that changes in the rank of ports on the gross tonnage scale can be explained only by breaking down the volume of cargo into its overseas, coastal and transhipment components. In attempting to evolve a tentative hierarchy for 1972, the reverse procedure appears to hold true in so far as a scale can be constructed only from an assessment of changes within the three component elements. However, it was stressed in the detailed analyses that

¹Proposed by the Export and Shipping Council, September 1964.
²Producer Boards' Shipping Utilisation Committee (N.Z.) and New Zealand Overseas Trade Streamlining Committee (London), New Zealand Overseas Trade, Report on Shipping, Ports, Transport and other Services, London, 1964.
⁴The year 1963 was selected as it was the last one for which statistics were available and the choice of 1972 stemmed from the availability of material collected by various harbour boards to support their submissions to the World Bank for loans for construction purposes.
the variations stemmed from changes in individual commodities. Projection of the trends of the individual commodities forming the three component elements over the period 1959-63 seems, therefore, to be the best method available for estimating the tonnages of individual ports. Estimates based on past trends alone would be unrealistic in a country such as New Zealand, where rapid growth and change are taking place in all spheres of economic activity. Accordingly, in producing each individual estimate, account has been taken of the major factors, such as population, manufacturing and communications, which are likely to affect the trade of a port. Although there are extreme difficulties inherent in estimating future tonnages on a port basis, it is considered essential that some attempt be made on a national scale, in order to gain a measure of guidance, however inadequate, for directing the development of ports. Thus, the pattern of analysis is to consider possible changes in the overseas, coastal and transshipment trade, in the light of the two detailed studies and detailed information on predicted changes. In the analysis it is possible to recognize universal factors which affect all components and influences which are largely confined to a particular element of the gross tonnage. Each of the two sets of factors is examined in turn.

Universal factors

Seaports, as the detailed studies emphasised, are extremely sensitive to the prevailing economic conditions. Thus, it is important to state that the broad setting for the period 1963-72 is one of economic expansion. No allowance is made for possible repercussions from unfavourable trading conditions, which may eventuate if Britain’s entry into the European Economic Community deprives New Zealand of a large share of its most important outlet for pastoral produce. Indeed, the period is conceived to be one of prosperity, with perhaps only temporary setbacks from recurrent balance of payment crises.

Assuming that the present annual rate of population increase is maintained at 2.1 per cent, New Zealand’s population will be over three million in 1972.\(^5\) Imports are expected to keep pace with the growing demand

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and exports to rise in order to provide the necessary overseas funds for increasing the living standards of the enlarged population. The inter island component of the coastal trade is also likely to expand as the population increase, which will not be evenly distributed, will accentuate internal differences. Of the areas defined by the Ministry of Works, Auckland, South Auckland, The Bay of Plenty, Christchurch and Southland will probably expand at a greater rate than the national average, whereas Canterbury, Coastal and Central Otago and the West Coast will fall well below the national average (Table LXXVIII). The effect of the differential increase is, therefore, likely to result in a marked expansion in the volume of coastal and overseas tonnage handled by New Zealand ports.

The rise in population will undoubtedly be accompanied by an expansion of secondary industry as the expanded consumer market will permit and encourage the development of new products. Signs of New Zealand's growing industrial maturity are already apparent in the expanding pulp and paper industry and the opening of an oil refinery at Whangarei (1964). Further evidence will be manifest with the establishment of the proposed aluminium smelter at Bluff and the iron and steel works planned for South Auckland. As the new developments are likely to be confined to a single unit, an increased volume of inter island commodity movements by sea is anticipated. However, the increases in the overseas and coastal trade are expected to be channelled through a limited number of ports. Indeed, without the introduction of planning to disperse industry throughout the country, it is expected that the new industries will be concentrated on Auckland and, to a lesser extent, Christchurch and Wellington. Thus, the developments in industry are likely to parallel the movements in population in favouring certain areas at the expense of others.

Improvements in road and rail transport, to cope with the expected increase in the volume of traffic, are not expected to disturb the hinterland boundaries established in 1961 (Figs. 37, 47 and 50). and favour one port compared with another. There is, however, one important exception. The completion of the tunnel through the Kaimai Range inland from Tauranga, will

move the port's freight rate advantage over Auckland to north of Hamilton.\(^7\)

It is estimated that 320,000 tons, which otherwise would have been handled by Auckland, will be diverted through Tauranga in 1972.\(^8\) Apart from Tauranga, there is little evidence that any other port will benefit specifically from the general improvement in communications.\(^9\)

Thus, the broad setting envisaged, in assessing tonnages for 1972, is a country with a prosperous economy, based on an increased volume of pastoral produce, an expanded population, a diversified industrial base and improved internal communications. The impact of these universal factors on individual ports must be considered together with influences confined primarily to one of the component elements of the gross tonnage. Each component is, therefore, examined in turn.

**The Overseas Component**

It is anticipated that the overseas component will provide 60 per cent of the gross tonnage in 1972. In calculating the overseas tonnage, allowance has been made for changes in its constituent elements of imports and exports. The two elements are now considered separately.

**Imports**

Imports are expected to provide 69 per cent of the overseas tonnage in 1972. Yet, the prediction of the imports for individual seaports is particularly hazardous as the value in any one year is subject to controls exercised by the government. The volume imported depends largely on overseas earnings, which are related to changes in markets and prices for pastoral produce. To maintain full employment and industrial expansion, however, the imports of raw materials must expand concurrently with the population of a port's hinterland, except for commodities diverted through another port. Indeed, dispersion of certain commodities handled in bulk is anticipated in the estimates. For example, new fertiliser works at Whangarei, Wellington and Timaru will result in a dispersion of cargo from other ports.

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\(^8\)Tauranga Harbour Board: *Submissions to the World Bank*, Tauranga, 1962 (in the files of the Board).

\(^9\)The Lyttelton Road Tunnel (opened 1964) is not expected to have a marked impact on the volume of traffic handled by the port.
However, the most outstanding change which has to be taken into account in assessing import tonnages for 1972 is the opening of the Whangarei oil refinery. Ports which received their supplies of petroleum products from overseas in 1963 will receive them coastwise from Whangarei as from 1964. The only port excepted will be Whangarei, which will benefit enormously from large imports of crude oil. Some allowance is made for Wellington, which will remain as the distribution port for special grades of imported oil and motor spirit. No allowance is made in the estimates for the proposed aluminium smelter at Bluff or for the repercussions of the exploitation of natural gas which may be channelled through New Plymouth. Yet, taking into account the establishment of the iron and steel works scheduled for South Auckland, together with other relevant factors, it is considered that an annual increase of two per cent represents a realistic estimate of the growth of imports over the next ten years. Adjustments for slower rates of population growth in areas such as Otago have to be made. Different estimates have to be employed for various commodities. Artificial manure, for example, is expected to increase by two per cent at Auckland, four per cent at Whangarei and five per cent at New Plymouth.10 The estimates of imports need constant revision as new information comes available, for the detailed analyses stressed that imports fluctuate widely, in response to a large number of factors.

Exports

Exports are expected to contribute 31 per cent of the overseas tonnage in 1972. The estimate of exports is obtained more easily than that of imports as the likely quantities of the three main groups of commodities - pastoral produce, fruit and timber products - have already been calculated. Changes in pastoral produce apply to the majority of ports, but the variations in the export of fruit apply particularly to Napier, Wellington and Nelson and timber products to Tauranga and Nelson.

Estimates of the export of pastoral produce have been made from assessments provided by agricultural field officers of the likely increase by

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10Estimates were supplied by the Auckland Harbour Board, Whangarei Harbour Board and the Taranaki Harbour Board respectively.
counties, based on the trends of the preceding five years.\(^{11}\) The counties are amalgamated into port hinterlands on the basis of boundaries defined for 1961 (Fig. 47). Allowances are made, however, for 60,000 tons of butter from Auckland and Bay of Islands to pass through Whangarei\(^{12}\) and for 80,000 tons of frozen meat, butter and meat products to be channelled through Tauranga.\(^{13}\) It is also assumed that Otago will gain 10,000 tons from the new freezing works in Central Otago. Taking the adjustments into account, the frozen meat, wool, milk products, butter and cheese tonnage are estimated on the assumption that the annual increase for each hinterland will not change between 1963-72.

Before arriving at the figure for exports, domestic consumption is estimated for each hinterland. Despite the likelihood of stock movements from one hinterland to another, it is not possible to allow for these as they do not appear to follow a predictable pattern. In spite of the omission, however, the changes in the export of pastoral commodities are expected to reflect variations in production within port hinterlands.

The anticipated increase in fruit exports, which will be handled largely by Napier, Wellington and Nelson, is based on the New Zealand Apple and Pear Board's projections, whereas the expected expansion of pulp and paper shipments is derived from information provided by individual firms. Allowance is made for the suggested paper mill at Nelson\(^{14}\) and the decline in sawn log exports from Tauranga to 70,000 tons a year after 1967.\(^{15}\) Although the projections for exports may appear more soundly based than those for imports, they are still subject to considerable fluctuation, in response to changes in production, markets and government policies.

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\(^{14}\) Estimate supplied by Whangarei Harbour Board.

\(^{15}\) Estimate supplied by Tauranga Harbour Board.


\(^{15}\) Estimate supplied by Tauranga Harbour Board.
The Coastal Component

The coastal component is expected to record an annual increase of two per cent, which is comparable to the projected increases in the overseas trade. Although improvements in transport are likely to diminish intra island movements of general cargo, the decline will be more than compensated for by an enormous increase in the volume of intra island and inter island movements of bulk commodities, particularly with the coastwise distribution of refined petroleum products from the new oil refinery at Whangarei and an expansion in cement shipments from Whangarei, Westport and Tarakohe, to meet the growing demand.

The coastal trade of Picton and Wellington, also, is expected to expand greatly with the addition of a sister ship to the G.M.V. *Aramoana*, which has been operating a rail/road ferry between the two ports since August 1962. The effect of this service has had such a radical impact on the coastal trade that a brief study is made of its influence by mapping the origin and destination of the ferry's northbound and southbound cargo (Fig.56).

The main area served by northbound traffic (Fig.56), consisting largely of potatoes, flour, paper and fruit (Table LXXIX), is 150 miles from Wellington. On a cost basis the rail/road ferry is not very favourably placed, compared with the normal coastal shipping services outside this area (Table LXXX). However, the service area clearly extends beyond the economic limit as the G.M.V. *Aramoana*'s twice daily service can offer regularity and less damage and pilferage than the traditional coastal shipping services.

The area served by the southbound traffic, in contrast, is more restricted in its scope (Fig.56). Consisting largely of general cargo from Wellington and, to a lesser extent, from Auckland (Table LXXIX), the traffic is highly concentrated on the Christchurch area. There are, however, smaller shipments to Blenheim, Nelson, Dunedin and Invercargill. It is clear from both maps that the twin foci of the system are the Wellington and Christchurch metropolitan areas.

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16 Provision has been made for products from the refinery to be conveyed in tankers of up to 18,000 tons to the main New Zealand ports. These tankers are too large for ports such as Gisborne, Wanganui, Picton and Oamaru, which were previously served by M.V. *Tanea*. Gisborne will, in future, receive its petrol supplies by rail from Napier, Picton by road from Nelson, Wanganui by rail from New Plymouth and Oamaru by road from Timaru and Dunedin.
In view of the impact of the rail/road ferry, there is a need to revise drastically the regional approach used in the detailed analyses of the coastal trade as there are movements of cargo away from the nearest port and even from the main regional port. It is difficult, however, to assess the effect of the rail/road ferry, for there has not been time to study its long term effects. Indeed, in the absence of any other data, the estimate for Picton in 1972 is based on only a three monthly period. It assumes that Picton will capture trade previously handled by Wangami, Nelson and Motueka, but it is not anticipated that Lyttelton will be greatly affected. By 1972 there will be two inter island roll on/roll off ferries, operating between Lyttelton and Wellington. Wellington, as the termini of the roll on/roll off and the rail/road ferries, is expected to benefit greatly from the expansion of the inter island trade from Lyttelton and Picton. The coastal trade, therefore, is likely to be rejuvenated as the introduction of new types of ships and quicker turn-rounds will enable shipping to compete on more favourable terms with the railways for intra island cargoes. However, the expansion of the coastal trade is likely to be confined to a limited number of ports.

The Transhipment Component

The practice of transhipping goods is expected to decline. It is anticipated that the decline will have a marked effect on Wellington only and provision in the estimates is made accordingly.

If the predictions made for the three components of the gross tonnage materialise, it is expected that the volume of cargo handled by 30 ports will increase from 13.5m. tons in 1963 to an estimated 18.1m. tons in 1972, an increase of 76 per cent.

Changes in Status

It is anticipated that the marked increase in tonnage will disturb the ranking of ports on the gross tonnage scale (Fig.57, Table LXXXI). Using the framework already established for classifying ports - with above five per cent of the gross trade as major, between above one per cent and under five per cent as secondary, and under one per cent as minor - it is expected that there will be several changes within and between classes.

17 Intra island shipments of cement from Westport to Timaru will be sent coastwise in a bulk carrier.
It is likely that the number of major ports, handling individually over five per cent of the gross tonnage, will be augmented by Whangarei in 1972 (Fig. 57). Indeed, Whangarei will replace Auckland as the principal port of the Dominion. Only Tauranga, of the other major ports, will improve its position as the share of Auckland, Wellington and Lyttelton will decline. The aggregate share of the major ports will, however, increase from over 63 per cent in 1963 to over 76 per cent in 1972.

With the exception of Whangarei, the individual shares of all ports with secondary status in 1963 - handling between one and five per cent of the gross tonnage - will decline (Fig. 57). It will result in Westport, Tarakohe and Greymouth losing their secondary status as their share is expected to fall below one per cent. Within the secondary class, Otago, Picton and Nelson are likely to decline. The cumulative effect of the changes will result in a decline in the proportionate share of the secondary ports, from almost 31 per cent in 1963 to 19 per cent in 1972.

It is anticipated that Ohiwa will be the only minor port to increase its percentage of the gross tonnage (Fig. 57). All the other ports are expected to decline. Yet, with the addition of the former secondary ports of Westport, Tarakohe and Greymouth, the share of the minor ports is expected to increase slightly, from three per cent in 1963 to over four per cent in 1972. Thus, the increased percentage of the major and minor ports and the decreased share of the secondary ports appears to be related to the movements of ports between classes.

**Changes in Concentration**

When the changes in the percentages on the gross tonnage scale between 1963-72 are translated into absolute terms (Fig. 58, Table LXXXI), it is clear that the decentralization of trade from the metropolitan areas, which was revealed between 1950-61, will be accentuated. The outstanding feature of the changes in concentration is the phenomenal increase at Whangarei. Indeed, the increase is expected to be so great that Tauranga and Ohiwa, serving the timber areas of the Volcanic Plateau, are the only ports likely to record gains. Clearly the gains will be made at the expense of Auckland/Onehunga, Wellington.
Lyttelton and Otago. The losses at the secondary ports of Napier, New Plymouth and Bluff will be comparatively modest. This marked decentralization of trade is likely to run contrary to the forces centralizing business, commerce and industry in the Auckland and, to a lesser extent, in the Wellington and Christchurch metropolitan areas.

Towards a National Plan for Port Development

The ranking of ports on the gross tonnage scale for 1972, therefore, suggests what will happen if present trends continue and scheduled plans materialise. No attempt has been made to incorporate proposals for the national development of ports. There is also no suggestion that the ranking of ports in 1972 will be the most desirable. Indeed, there is abundant evidence that certain aspects of the development of New Zealand seaports are most unsatisfactory. A national plan for port development, to improve existing conditions, would seem most propitious if it could hasten the turn-round of shipping, avoid the needless duplication of port facilities and make maximum use of existing and proposed transport media.

Several schemes for the national development of ports have been mooted. Most of the proposals are concerned with the overseas trade and give scant attention to the coastal component of the gross tonnage. As imports are already effectively rationalized by the purchaser, the majority of proposals are concerned with exports, although the external trade forms only a small proportion of the traffic handled. Already there is a scheme in operation for concentrating not less than 60 per cent of the ships engaged in the New Zealand refrigerating trade on two-port loading. There is also a more radical scheme for loading all South Island meat at Bluff and Timaru - the two ports with mechanical meat loaders.

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19 Details of the scheduled development of individual ports are given in Appendix III.


21 The main benefit of the system introduced in June 1964 is a saving in loading time. It is not expected to result in the cessation of exports of primary produce at any port or to deprive one port of cargo at the expense of another.

22 Timaru Harbour Board, Cost of Concentrating Meat in the South Island on Timaru and Bluff, Timaru, 1964, (Mimeoographed).
With the proliferation of schemes aimed at benefitting individual ports, there is a pressing need to establish clearly objectives for the development of New Zealand seaports and to test, against established objectives, any new proposals. The concluding chapter has shown what will happen if certain assumptions are fulfilled. It has not attempted to pronounce judgement on any scheme. However, it is hoped that this contribution towards an understanding of the development of ports will be of value both in establishing objectives for port development and in indicating possible lines of development which would be in the best interests of New Zealand.
Appendix I

RECURRENT FEATURES IN THE LAYOUT OF 
NEW ZEALAND SEAPORTS

The study of the development of seaports since the beginnings of 
organized settlement in 1840 (Part I) emphasised the close harmony between the 
growth of ports and the development of the transportation network. A persistent 
feature of the analysis was the marked variations in emphasis on particular ports, 
response to changes in their comparative locational advantages. The effect 
wrought by the variations on the layout of ports was examined as an integral 
part of the broad changes in the development of these ports. However, as the 
detailed alterations in layout had a tangential, but important, effect on the 
changes in the status of New Zealand ports (Part II), a study of the recurrent 
features appears warranted.

By the beginning of the first detailed study in 1926, New Zealand ports 
exhibited a whole gamut of different layouts, in various stages of development, 
ranging from primitive lightering on exposed coasts to highly developed ports 
providing quays and wharves where ships could berth, together with a great deal 
of ancillary equipment - transit sheds, warehouses, passenger and customs 
accommodation, offices and road and rail approaches (Plate XII). As the basic 
layout of New Zealand ports had been realised by this date, it is possible to set 
up an idealized, three phase cycle to serve as a standard for comparing the 
evolution and present characteristics of New Zealand ports (Fig.59). Each 
phase is characterized by a change in the existing structure of the port, or by 
new additions to port facilities, made necessary by increases in traffic and 
alterations in ship design and size.

(1) LIGHTERING.

The first phase of port development in New Zealand involved the trans- 
shipment by lighter to and from a vessel anchored in the middle of a "natural 
harbour" (i) river (ii) or roadstead (iii). The handling of cargo must 
be carried out twice in either direction. Primitive wharves were often built 
to accommodate the lighters and facilitate the transaction (Plate XIII). Such 

1 The term 'natural harbour' in this survey does not include rivers.
operations were uneconomic, particularly for handling bulk cargoes. The weather was liable to interrupt loading or discharge of cargo if the shelter provided by the harbour was imperfect. Yet, these conditions have persisted at some ports in New Zealand from 1840 to the present day.

(2) HARBOUR WORKS AND PROVISION OF WHARVES

Lightering did not fulfill the basic requirement of a port with regard to shelter or the convenient handling of goods and passengers. The second phase in the evolution of seaports was, therefore, to develop shelter and wharves deep enough for the direct loading of ships. In the natural harbours shelter was not a pressing problem, although artificial works were added locally as protection against winds, or to deflect the tidal stream from the berthing area. To facilitate the discharge of cargo, deep-water wharves and quays were constructed to allow ships to come alongside - the number depending on the amount of cargo to be handled. In the rivers the main problem was that of the shifting bar at the entrance. If a ship was crossing the bar in a heavy sea it might touch the bottom and lose its bearings. This often resulted in the ship’s grounding. The standard solution to the problem of the bar was to make maximum use of the tidal compartment of the river by confining the flow between training walls and breakwaters, and concentrating its scouring action on the bar. Marginal quays were added for vessels to berth alongside, once they had entered the river. Where the trade warranted a port, but where there was no suitable natural harbour or tidal river, an artificial harbour was often formed by attaching a breakwater to a promontory. Berthage was provided by building finger piers within the breakwater harbour (Plate XIV).

(3) DREDGING

As ships grew larger - particularly after 1881 - it became increasingly difficult to berth alongside without dredging. The problem was of least importance in the natural harbours, although dredging was necessary to overcome shallowing and to keep the fairway clear. In the rivers, once the improvements due to the breakwater had been offset by a re-establishment of the bar, further extensions were necessary. As it was difficult to maintain continuous dredging on the exposed bars, operations were normally confined to keeping the berths clear of river debris. Since breakwater
extensions were costly and difficult to maintain, the river ports faced a continual problem of providing navigable depths over the bar. The conditions were exacerbated by bad weather and a low river in summer. As overseas ships became too large to enter the confines of the river port, many of them had to revert to roadstead lightering. The only alternative was to abandon the river site and construct an artificial port on the coast. In many cases artificial harbours took the place of a river port. But dredging was necessary to keep even the artificial harbours (Illili) clear, as the encircling breakwater interrupted the free flow of drift material along the coast, causing shoaling at the mouth of the harbour (Plate XV). Indeed, since the first decade of the twentieth century, dredging has been the standard practice for dealing with increases in the size of ships visiting New Zealand waters. Wet docks have not been necessary, as the tidal range is less than 12 feet at all ports.

Since 1926, the developments in the layout of New Zealand seaports have been either movements within the cycle or an elaboration of the phase they have reached (Table LXXXII). It was clear by 1926, however, that the prospects of the less well-equipped ports ultimately depended not only on the opportunities provided by the transport network, but also on the physical possibilities offered by the individual sites.
Appendix II

QUESTIONNAIRE

The following questionnaire was used in interviewing the various port authorities in New Zealand to elicit comparable information.

NEW ZEALAND PORTS

General Background Information

1. Details concerning Harbour Board: date established, electoral area, land rates, copies of annual financial report.

2. A plan or plans showing the existing facilities at each of the ports concerned.

3. A copy of port handbook or brochure.

Engineering and General

1. Obtain the following information in connection with each of the ports where not given in the port handbook or brochure.

   (a) A brief description of the principal port facilities.

      Accommodation

      Name of berth, date built, length, depth alongside, transport on wharves, function of berth, any change in function of berth.

      Size of the following areas:
      - transit sheds
      - cool stores
      - open platform space
      - special warehouse accommodation.

   (b) Tidal range (spring tides and neaps).

   (c) Nature and depth of entrance channels.

   (d) Depth below low water at berths.

   (e) Amount of annual maintenance dredging:
      (i) in approaches.
      (ii) in harbour.
      (iii) at berths.

      A brief note as to the principal sources of siltation.

   (f) A brief description of the method of carrying out the maintenance dredging, including the method of disposal of spoil.

   (g) Conditions as to winds and wave action in the port.

   (h) Location of anchorage, and the number of vessels which can anchor.

   (i) Location and number of buoy berths.

   (j) Number and capacity of dry docks.

   (k) Availability and capacity of quay cranes at various berths.
(l) Availability and capacity of floating cranes.

(m) Brief technical particulars of any other mobile or fixed mechanical handling appliances.

(n) A general description of the methods used in handling cargo, including details of the numbers and types of portable and fixed mechanical appliances available.

(o) Estimates of the maximum annual capacity of the existing port facilities to deal with principal categories of traffic, with an explanation of the manner in which the estimates have been arrived at.

**Port Dues and Charges**

1. An up-to-date copy of the schedule of dues and charges of each of the Boards concerned, together with information as to who is responsible for payment in respect of each principal category.

2. Estimates of total normal costs incurred by representative ships during a normal call at port and by representative cargoes brought in or taken out.

   (i) Charges levied on ships for pilotage, towage, berthing, unberthing, channel conservancy, use of cranes, overtime working etc.

   (ii) Charges levied on the cargo for lighterage, stevedoring, loading from and discharging to quay, handling ashore, storage in transit sheds, etc.

3. Comparison of charges levied on representative ships with the freight revenue they earn from the cargo loaded and discharged at port. Comparison of charges levied on cargo moving through port with FAS value outbound and CIF value inbound.

**Traffic Statistics**

(a) Changes in the volume, nature, origin and destination of tonnage between 1926-36 and 1950-61.

(b) A forecast of the tonnage of cargo which will pass through the port annually during the years 1962-67 broken down as in "Transport Statistics" Table 19 and with a brief explanation of how the amount has been arrived at in the case of the principal commodities.

(c) A forecast of the approximate tonnages which will pass through the port in 1972, broken down into principal types of cargo imports/exports and foreign/coastal, only, with a brief explanation of how the forecast has been arrived at.

(d) Frequency of overseas and coastal shipping services. Note extinct services.

(e) A list of ships which used the port during 1961 giving

   (i) N.R.T.
   (ii) Tonnage discharged.
   (iii) Tonnage loaded.
   (iv) Number of hours in port.
   (v) Number of hours at berth.
   (vi) Number of hours between reaching port and berthing.
Economic Information

(a) Delimitation of port's inland service area. Brief review of main determining factors such as location of country's resources and industries, availability of inland transport, nature of export surpluses and import needs. Competitive ability of other ports to serve the same area.

(b) Sketch map of the inland service area showing:

(i) Location of industries, resources and towns.

(ii) Access routes to port by rail, road, pipeline and coastal shipping.

(iii) Main flows of inbound and outbound traffic.

(c) Brief description, supplementing (i) and (ii) above, of productive resources and facilities of inland service area, growth of its production of trade in past 10 years, outlook for its production and trade in next 5 - 10 years.

(d) Identification of regions in New Zealand or abroad, where port's inbound cargo originates, where outbound cargo terminates. Analysis of port's locational advantages and disadvantages for export/import traffic, as determined by such factors as country's normal sources of supply abroad and normal foreign markets, proximity to main routes of world shipping, possibility of obtaining return cargo, nature of country's export surpluses and import needs, modalities of trade agreements and currency controls.

(e) Description of extent to which ships calling at port serve refineries, flour mills, sugar mills, fertiliser works, power plants etc. located in a port or near it; extent to which they serve industries, commerce and consumers of built-up area surrounding the port or in close proximity to it; extent to which port is shipping outlet for bulk raw materials brought down from interior and or/gathering and distribution centre for general cargo moving to/from interior.

(f) Review of the adequacy and efficiency of existing means of transport between one port and its inland service area. Plans, if any, of enlarging and improving these means.

Proposed Developments

1. Character of proposed developments.

2. Statement of main economic benefits to be derived from the planned works and equipment including, as appropriate, any or all such benefits as:-

(a) relief of present port shipping and/or cargo congestion.

(b) additional traffic to absorb future growth of traffic.

(c) speedier turn round.

(d) improved handling - elimination of multiple handling expenses.

(e) development of inland service area as result of lower costs.

(f) provision of port facilities required by industries now located or to be built in the port area such as refineries, packing plants, cool storage, flour mills and fertiliser works.

(g) provision of port facilities required by inland industries now served or to be served by port such as smelters, etc.
3. For each class of economic benefit, explanation of the modus operandi by which the new enlarged or improved facilities would help to realise it, e.g. sheltering ships from storms and speeding turn-around by breakwater construction; making it possible for larger, more heavily laden ships to enter port by channel dredging; faster, more efficient loading and discharge of general cargo by using cranes, fork lifts and other equipment; faster, more efficient working of bulk cargo by provision of conveyors, pipelines, special equipment for loading grain.
Appendix III

SURVEY OF THE MAIN NEW ZEALAND PORTS

A brief summary is given of each of the main ports based on information obtained from individual harbour authorities. The labour statistics refer to the registered strength. They do not include casual (seagull) labour. The following abbreviations are used -

N = neap tide.
S = spring tide.
M.L.W.S. = Mean depth at low water springs.
ADMINISTRATION.

Harbour Board :- Bay of Islands Harbour Board.
Established :- 1953 (in re-constituted form).
Number of members :- 9
Electoral area :- Bay of Islands, Hokianga, Mangonui and Whangaroa Counties and Kaitaia Borough.

NAVIGATIONAL FEATURES.

Tidal range :- 4.8 ft. (N), 6.4 ft. (S)
Nature and depth of entrance channel :- Natural harbour. Dredged channel 24 ft. with sand and shell bottom.
Amount of annual maintenance dredging :- Nil.
Wind and wave action :- Exposed to N.W. and N.E. No swell.
Tidal rate :- Off Opua Wharf 2 to 3 knots are experienced.
Restrictions on entry of shipping :- Nothing to interfere with movement of ships.

ACCOMMODATION.

No. of berths :- 4
Total berthing :- 1,450 ft.

<table>
<thead>
<tr>
<th>Berth</th>
<th>Date</th>
<th>Length</th>
<th>Depth</th>
<th>Function of berth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opua E</td>
<td>1923</td>
<td>650</td>
<td>28</td>
<td>Overseas</td>
</tr>
<tr>
<td></td>
<td>enlarged</td>
<td>400</td>
<td>11</td>
<td>Coastal</td>
</tr>
<tr>
<td>Russell N</td>
<td>1925</td>
<td>200</td>
<td>10</td>
<td>Not in commercial use</td>
</tr>
<tr>
<td>S</td>
<td>1925</td>
<td>200</td>
<td>13</td>
<td></td>
</tr>
</tbody>
</table>

Transport on wharves :- Rail at Opua.
Transit sheds :- No transit sheds on wharf.

METHODS OF LOADING AND DISCHARGING.

Ship's gear

LABOUR. 71 (casuals no registered labour).

DEVELOPMENTS.

None scheduled.
WHANGAREI
(Fig.61, Plate XVII, XVIII and XIX).

ADMINISTRATION.

Harbour Board :- Whangarei Harbour Board.
Established :- 1907.
Number of members:- 9
Electoral area :- City and County of Whangarei (except that portion in Waipu River Board).

NAVIGATIONAL FEATURES.

Tidal range :- 5.4 ft. (N). 7.8 ft. (S).
Nature and depth of entrance channel:- Outer entrance 700 ft. wide 54 ft.
depth. Channel to Port Whangarei 200 ft. wide, dredged to 17½ ft. M.L.W.S.
Amount of annual maintenance dredging:- Expanding channel width.
Wind and wave action:- Protected from all winds. Wave action slight.
Tidal rate :- Entrance 3 knots. Main and Upper Harbour 1½ to 2 knots.
Restrictions on entry of shipping:- Length 575 ft., Beam 80 ft. Overseas vessels berthed in daylight only.

ACCOMMODATION.

No. of berths :- 14.
Total berthage :- 3,156 ft.

<table>
<thead>
<tr>
<th>Berth</th>
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<th>Length feet</th>
<th>Depth feet</th>
<th>Function of berth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Town (1865)</td>
<td></td>
<td>500</td>
<td>9.5</td>
<td>Coastal (general cargo)</td>
</tr>
<tr>
<td>Bulk Cement</td>
<td>1962</td>
<td>444</td>
<td>28</td>
<td>Coastal (cement)</td>
</tr>
<tr>
<td>Marsden Point</td>
<td>1962</td>
<td>240</td>
<td>18</td>
<td>Coastal (cement)</td>
</tr>
<tr>
<td>Tanker Berth</td>
<td>1963</td>
<td>Two pier heads 90 ft. long</td>
<td>60</td>
<td>Overseas (to serve tanker refinery).</td>
</tr>
<tr>
<td>Sand Landing</td>
<td></td>
<td>90</td>
<td>4.5</td>
<td>Sand for glassworks</td>
</tr>
<tr>
<td>Fertiliser Landing</td>
<td></td>
<td>47</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

Transport on wharves:- Rail and road.
Transit sheds :- Town Wharf 7,000 ft.

METHODS OF LOADING AND DISCHARGING.

Ship's gear. Floating crane also available.

LABOUR. 65 (registered).

DEVELOPMENTS.

Marsden Point Oil Refinery makes the following development necessary:
jetty for tugs, pilot launch, maintenance barge, marine base layout,
slipway and outdoor headquarters. Also building cool store accommodation.
AUSTRALIAN INSTITUTE

Harbour Board: - Auckland Harbour Board.
Established: - 1871.
Number of members: - 15.
Electoral area: - Principal local authorities are Auckland City, Waitakere, Raglan, Waipa, Waikato, Franklin and Manukau Counties (including cities and boroughs within these areas).

NAVIGATIONAL FEATURES.

Tidal range: - 5½ ft. (N), 12 ft. (S).
Amount of annual maintenance dredging: - Only at wharves.
Wind and wave action: - Problem of cross tide berthing. Very little swell.
Tidal rate: - Approaches and at berths ½ knots (N), 3 knots (S).
Restrictions on entry of shipping: - Nothing to interfere with movement of ships.

ACCOMMODATION.

No. of berths: - 20.
Total berthage: - 27,302 ft.

<table>
<thead>
<tr>
<th>Berth</th>
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<th>Length feet</th>
<th>Depth feet</th>
<th>Function of berth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eastern Tide Wall E</td>
<td>1921</td>
<td>660</td>
<td>33</td>
<td>Overseas</td>
</tr>
<tr>
<td>Freyberg E</td>
<td>1958/60</td>
<td>620</td>
<td>35</td>
<td>Overseas</td>
</tr>
<tr>
<td>W</td>
<td></td>
<td>1098</td>
<td>33</td>
<td>Overseas</td>
</tr>
<tr>
<td>W</td>
<td></td>
<td>1104</td>
<td>33</td>
<td>Overseas</td>
</tr>
<tr>
<td>Jellicoe E</td>
<td>1939/47</td>
<td>618</td>
<td>32</td>
<td>Overseas export</td>
</tr>
<tr>
<td>W</td>
<td></td>
<td>650</td>
<td>34</td>
<td>Overseas</td>
</tr>
<tr>
<td>Bledisloe E</td>
<td>1904/9</td>
<td>900</td>
<td>28</td>
<td>Coastal</td>
</tr>
<tr>
<td>W</td>
<td></td>
<td>814</td>
<td>30</td>
<td>Overseas</td>
</tr>
<tr>
<td>Kings E</td>
<td>1909/11</td>
<td>651</td>
<td>17</td>
<td>Coastal</td>
</tr>
<tr>
<td>W</td>
<td></td>
<td>655</td>
<td>23</td>
<td>Coastal</td>
</tr>
<tr>
<td>Marsden E</td>
<td>1906/13</td>
<td>1081</td>
<td>33</td>
<td>Overseas</td>
</tr>
<tr>
<td>W</td>
<td></td>
<td>762</td>
<td>33</td>
<td>Overseas</td>
</tr>
<tr>
<td>Queens E</td>
<td>1922/24</td>
<td>1100</td>
<td>33</td>
<td>Passenger terminal</td>
</tr>
<tr>
<td>W</td>
<td></td>
<td>1100</td>
<td>33</td>
<td>Overseas</td>
</tr>
<tr>
<td>Princes E</td>
<td>1938</td>
<td>494</td>
<td>19</td>
<td>Coastal</td>
</tr>
<tr>
<td>W</td>
<td></td>
<td>484</td>
<td>18</td>
<td>Coastal</td>
</tr>
<tr>
<td>Hobson E</td>
<td>1920/31</td>
<td>33</td>
<td></td>
<td>Tankers, gypsum coal,</td>
</tr>
<tr>
<td>W</td>
<td></td>
<td>18</td>
<td></td>
<td>Cement</td>
</tr>
<tr>
<td>Bulk Cement</td>
<td>1958</td>
<td>26</td>
<td></td>
<td>Sugar</td>
</tr>
<tr>
<td>Chelsea Sugar</td>
<td>1938</td>
<td>20</td>
<td></td>
<td>Coal</td>
</tr>
<tr>
<td>Chelsea Coal</td>
<td>1922/24</td>
<td>11</td>
<td></td>
<td>Sugar</td>
</tr>
<tr>
<td>Chelsea Lighter E</td>
<td></td>
<td></td>
<td></td>
<td>Coal</td>
</tr>
<tr>
<td>Davenport</td>
<td>1938</td>
<td>11</td>
<td></td>
<td>Shingle and sand</td>
</tr>
<tr>
<td>Galileo</td>
<td>1938</td>
<td>30 (Navy)</td>
<td></td>
<td>(Navy) tankers and vessels</td>
</tr>
</tbody>
</table>

Transport on wharves: - Principally rail.
Transit shed: - 987,459 sq.ft. The Board also has 620,000 sq.ft. of off-wharf storage where unclaimed cargo is stored.

Maximum capacity of port: - 42,000 tons.

METHODS OF LOADING AND DISCHARGING.

Wharf cranes, an 80 ton floating crane, ship's gear and a conveyor at Bledisloe Wharf for moving dairy produce from the cool store to ship's side.
Bulk discharging facilities are available for cement (built 1960), sugar (1958), potash (1958), wheat (1951), oil (1927/8), coal, gypsum, phosphate, maize, and sand and shingle.

LABOUR. 1,700 (registered).

DEVELOPMENTS.

Character: The reconstruction of King's and Marsden Wharves and the building of Tasman wharf are envisaged for 1970. Further development after 1980 can still take place in the present port area by developing the western area between Princess and Wynyard wharves. The development of the Upper Te Atatu area (earmarked for new accommodation) will not be required unless there is a demand for an industrial site which requires close association with water transport.

Aims: To avoid congestion and to allow for expansion of trade.

ONEHUNGA
(Fig.63, Plate XXII)

ADMINISTRATION.

Harbour Board: Auckland Harbour Board.

NAVIGATIONAL FEATURES.

Tidal range: 6 ft. (N), 11 1/2 ft. (S).
Nature and depth of entrance channel: Natural Harbour. Entrance 19 ft.
Sand bottom. Problem of shifting bar.
Amount of annual maintenance dredging: At berths only.
Wind and wave action: Problem W.S.W. wind at Manukau Heads.
Tidal rate: Entrance 3/4 knots, Tidal stream in channel 2 2/3 knots.
Restrictions on entry of shipping: Maximum draught 13 ft. Problem of shifting bar.

ACCOMMODATION.

No. of berths: 2.
Total berthage: 955 ft.

<table>
<thead>
<tr>
<th>Berth</th>
<th>Date</th>
<th>Length feet</th>
<th>Depth feet</th>
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</thead>
<tbody>
<tr>
<td>Onehunga 1</td>
<td>-</td>
<td>525</td>
<td>13</td>
<td>Coastal (cement)</td>
</tr>
<tr>
<td>2</td>
<td>1963</td>
<td>430</td>
<td>13</td>
<td>New wharf</td>
</tr>
</tbody>
</table>

Transport on wharves: Road and rail.
Transit sheds: 34,667 sq.ft.

METHODS OF LOADING AND DISCHARGING.

Ship's gear.

LABOUR. 70 (registered).

DEVELOPMENTS.

Character: Increased transit accommodation (10,500 sq.ft.). Bulk cement silo, new wharf (430 ft.) and warehouse (5,400 sq.ft.).

Aim: To cope with increased trade.
TAURANGA
(Fig. 64, Plate XXIII and XXIV)

ADMINISTRATION.

Harbour Board :- Tauranga Harbour Board.
Established :- 1912
Number of members :- 10
Electoral area :- Rotorua County, Mt. Maunganui Borough, Tauranga County.

Navigational Features.

Tidal range :- 5 ft. (N), 7 ft. (S).
Nature and depth of entrance channel :- Natural Harbour. Constricted (width 600 ft.), depth 25 ft. M.L.W.S.
Amount of annual maintenance dredging :- Only at wharf.
Wind and wave action :- Need to use tug in westerly wind.
Swell not a problem.
Tidal rate :- Up to 3 knots in spring tides.
Restrictions on entry of shipping :- Maximum size permissible for vessel entering the port :- length 520 ft. beam no limit.

Accommodation.

No. of berths :- 7.
Total berthage :- 3,741 ft.

<table>
<thead>
<tr>
<th>Berth</th>
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<th>Length feet</th>
<th>Depth feet</th>
<th>Function of berth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Railway</td>
<td>1925/6</td>
<td>541</td>
<td>16</td>
<td>Coastal and trans-Tasman</td>
</tr>
<tr>
<td>Mt. Maunganui No. 1</td>
<td>1953/62</td>
<td>3200</td>
<td>28</td>
<td>Overseas</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td>25</td>
<td>Overseas</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td>28</td>
<td>Overseas</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td>28</td>
<td>Overseas</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td>28</td>
<td>Overseas (Tanker)</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td>29</td>
<td>Overseas</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td>29</td>
<td>Overseas</td>
</tr>
</tbody>
</table>

Transport on wharves :- Rail and road.
Transit sheds :- Mt. Maunganui Wharf No. 1 Shed - Floor area 8,500 sq.ft.
* No. 2 Shed - Floor area 24,625 sq.ft.

In addition there are two open storage areas of 28,500 sq.ft. and 112,000 sq.ft. respectively.

Railway Wharf :- One shed of 600 ton capacity.

Methods of Loading and Discharging.

Ship's gear and mobile cranes.

Labour. 509 (registered).

Developments.

There is the possibility of extending Mt. Maunganui Wharf by 600 ft. If the results from research on the model of port are favourable the port may be developed for exporting primary produce.
GISBORNE
(Fig.65, Plate XXV)

ADMINISTRATION.
Harbour Board: Gisborne Harbour Board.
Established: 1884.
Number of members: 12.
Electoral area: Gisborne and Cook, Waiapu and Waikohu Counties.

NAVIGATIONAL FEATURES.
Tidal range: 4 ft. (N) 4.5 ft. (S).
Nature and depth of entrance channel: Rock bottom 16 ft. deep.
Amount of annual maintenance dredging:--
Wind and wave action:-- N.w. winds off land can affect vessels if light loaded. Entrance affected by S. and S.E. winds. Roadstead exposed to S.E. winds - sends heavy swell into anchorage (even when light).
Tidal rate: ½ knot.
Restrictions on entry of shipping:-- Overseas ships cannot enter the port.
They are lightered in the roadstead. Maximum size permissible for vessels entering the port: Length 360 ft. beam 50 ft. Maximum draught: 18 ft. 6 in.

ACCOMMODATION.
No. of Berths: 4.
Total berthage: 1,444 ft.

<table>
<thead>
<tr>
<th>Berth No.</th>
<th>Date</th>
<th>Length (feet)</th>
<th>Depth (feet)</th>
<th>Function of berth</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2 3</td>
<td>1928/9</td>
<td>382</td>
<td>19</td>
<td>Coastal</td>
</tr>
<tr>
<td>4 5 6</td>
<td>1951</td>
<td>400</td>
<td>19</td>
<td>Tanker terminal</td>
</tr>
<tr>
<td>5 6</td>
<td>1952/3</td>
<td>(650)</td>
<td>10-15</td>
<td>Lightering</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Transport on wharves:-- Rail and road.
Transit shed:-- 8,503 sq.ft.

METHODS OF LOADING AND DISCHARGING.
Overseas ships lightered in the roadstead. Coastal vessels use ship's gear. Meat is loaded into lighters by conveyor belt at meat works.

LABOUR. 120 (registered).

DEVELOPMENTS.
Character:-- A scheme is about to be started to provide a wharf of 650 ft. with a depth of 32 ft. which would replace present loading from lighters in roadstead.
Aim:-- Reduce delays due to swell in roadstead, save money from lightering and promote districts development through a new fertiliser works based on imported manures.
NAPIER
(Fig.66, Plate XXVI)

ADMINISTRATION.

Harbour Board: - Napier Harbour Board.
Established: - 1875
Number of members: - 12
Electoral area: - Hastings (2), Napier (3), Hawke's Bay County (except Meeanee Riding) and Mohaka Riding in Wairoa County (3), Waipukurau (1), Taradale and Meeanee (1), Waipawa (1), and Otane (1).

NAVIGATIONAL FEATURES.

Tidal range: - 4½ ft. (N) 5½ ft. (S).
Nature and depth of entrance channel: - Breakwater harbour. 600 ft. at narrowest, depth 32 ft. Sandy bottom.
Amount of annual maintenance dredging: - Continual dredging in harbour to check drift of sand.
Winds and wave action: - Exposed to N.W. When wind through S. to E.N.E. get heavy swell. Ships have to put to sea in heavy swell because break moorings at berths.
Tidal rate: - Up to 1 knot at Springs.
Restrictions on entry of shipping: - Vessels other than exempted vessels not berthed at night. Maximum draught 28 ft. length 575 ft. Beam, no limit.

ACCOMMODATION.

No. of Berths: - 6.
Total berthage: - 4,840 ft.

<table>
<thead>
<tr>
<th>Berth</th>
<th>Date</th>
<th>Length feet</th>
<th>Depth feet</th>
<th>Function of berth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geddis E W</td>
<td>1939</td>
<td>790</td>
<td>35</td>
<td>Overseas (tanker)</td>
</tr>
<tr>
<td>Herrick E W</td>
<td>1942</td>
<td>830</td>
<td>35</td>
<td>Overseas</td>
</tr>
<tr>
<td>Higgins E W</td>
<td>1960</td>
<td>800</td>
<td>26</td>
<td>Overseas/Coastal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>800</td>
<td>32</td>
<td>Not in commercial use.</td>
</tr>
</tbody>
</table>

Transport on wharves: - Rail and road.
Transit sheds: - No. 1 shed 18,000 sq.ft.
                2 shed 21,600 sq.ft.
                3 shed 16,800 sq.ft. (under construction).

METHODS OF LOADING AND DISCHARGING.

Ship's gear.

LABOUR. 325 (registered).

DEVELOPMENTS.

Character: - An additional wharf 800 ft. by 90 ft. is expected to be completed by end of 1966. To overcome the problem of surge the eastern breakwater is being extended and a western breakwater is contemplated.
Aims: - New wharf to provide for extension of trade. Breakwater extensions to overcome problem of swell and surge in easterly storms.
NEW PLYMOUTH
(Fig.67, Plates XXVII and XXVIII)

ADMINISTRATION.

Harbour Board : - Taranaki Harbour Board.
Established : - 1875.
Number of members : - 12.

NAVIGATIONAL FEATURES.

Tidal range : - 8 ft. (N) 12 ft. (S).
Nature and depth of entrance channels : - Breakwater Harbour 850 ft. width.
Depth 29 ft.
Wind and wave action : - Gales in spring and autumn blow from westerly points (maximum recorded gust 89 m.p.h.). Heavy swells before N.W. wind. Wharves have wind screens.
Tidal rate : - Ebb and flow 1 knot.

ACCOMMODATION.

No. of berths : - 7
Total berthage : - 3,000 ft.

<table>
<thead>
<tr>
<th>Berth</th>
<th>Date</th>
<th>Length</th>
<th>Depth</th>
<th>Function of Berth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newton King No. 1</td>
<td>1923/7</td>
<td>1200</td>
<td>25</td>
<td>Coastal</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td></td>
<td>33</td>
<td>Overseas (tanker-white and black oil)</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td></td>
<td>33</td>
<td>Overseas (tanker-white oil)</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td></td>
<td>33</td>
<td>Overseas (tanker-black and white oil)</td>
</tr>
<tr>
<td>Moturoa No. 1</td>
<td>1877</td>
<td>1000</td>
<td>26</td>
<td>Dredge berth</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Rebuilt</td>
<td></td>
<td>Overseas all purpose</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>1955/7</td>
<td>700</td>
<td>Coastal, trans-Tasman</td>
</tr>
</tbody>
</table>

Transport on wharf : - Entirely rail (except for fertiliser which is carried by road transport).
Transit shed : - Wharves without transit sheds. Inward goods taken to New Plymouth by rail and sorted there. Maximum capacity of port (80 per cent occupancy rate) 668,270 tons.

METHODS OF LOADING AND DISCHARGING.

Wharf cranes, mobile cranes and ship's gear.

LABOUR. 315 (registered).

DEVELOPMENTS.

Character : - A major development is under consideration which would provide more accommodation for overseas ships and transit sheds for inward cargo. Includes additional breakwater.
Aims : - Additional cargo capacity and shelter of harbour.
WANGANUI
(Fig. 68)

ADMINISTRATION.

Harbour Board: - Wanganui Harbour Board.
Established: - 1877
Number of members: - 10
Electoral area: - Wanganui City, Wanganui, Waimarino and Waitotara Counties.

NAVIGATIONAL FEATURES.

Tidal range: - 6 ft. (N) 9 ft. (S).
Amount of annual maintenance dredging: - In channel, off wharves and in swinging basin.
Wind and wave action: - Exposed to westerly winds. Swell problem in westerly winds.
Tidal rate: - 2/3 knots (N) 3/5 knots (S).
Restrictions on entry of shipping: - Bar at entrance to port - depths vary between 10 ft. and 12 ft. Channel to town closed in 1956.

ACCOMMODATION.

No. of berths: - 4
Total berthage: - 1,900 ft.

<table>
<thead>
<tr>
<th>Berth</th>
<th>Date</th>
<th>Length feet</th>
<th>Depth feet</th>
<th>Function of berth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Castleclliffe No. 1</td>
<td>1886</td>
<td>18</td>
<td>18</td>
<td>Coastal (serpentines)</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>1900</td>
<td>18</td>
<td>Coastal (coal)</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>18</td>
<td>18</td>
<td>Coastal (tanker, cement)</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>1877</td>
<td>18</td>
<td>Closed</td>
</tr>
<tr>
<td>Town Wharf</td>
<td></td>
<td></td>
<td></td>
<td>Closed</td>
</tr>
</tbody>
</table>

Transport on wharves: - Rails and roads.
Transit sheds: - 32,000 sq.ft.

METHODS OF LOADING AND DISCHARGING.

Ship's gear and mobile cranes.

LABOUR. 85 (registered).

DEVELOPMENTS.

None scheduled.
**WELLINGTON**
*(Fig.69, Plate XXIX and XXX)*

**ADMINISTRATION.**

<table>
<thead>
<tr>
<th>Harbour Board</th>
<th>Wellington Harbour Board.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Established</td>
<td>1878.</td>
</tr>
<tr>
<td>Number of members</td>
<td>15</td>
</tr>
<tr>
<td>Electoral area</td>
<td>City of Palmerston North, Counties of Manawatu, Oroua, Horowhenua, Pohangina, Kaiunga, Kiwitea, Boroughs of Feilding, Foxton, Shannon, Otaki, Levin, City of Wellington, City of Lower Hutt, Boroughs of Petone and Upper Hutt, Hutt and Makaha Counties, Boroughs of Eastbourne and Tawa, Counties of Wairarapa South, Masterton, Pahiatua, Akitio, Eketahuna, Mauriceville and Featherston (including boroughs within counties).</td>
</tr>
</tbody>
</table>

**NAVIGATIONAL FEATURES.**

<table>
<thead>
<tr>
<th>Tidal range</th>
<th>2 ft. 6in. (N) &amp; 4 ft. 6in. (S)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nature and depth of entrance channels:</td>
<td>Natural harbour, width of entrance 1,000 ft. Controlling depth 38 ft.</td>
</tr>
<tr>
<td>Amount of annual maintenance dredging:</td>
<td>Only at wharves.</td>
</tr>
<tr>
<td>Wind and wave action:</td>
<td>Landlocked (prevailing wind NNW/SSE).</td>
</tr>
<tr>
<td>Tidal rate:</td>
<td>Neaps 2 knots, Springs 2½ knots.</td>
</tr>
<tr>
<td>Restrictions on entry of:</td>
<td>Nothing to interfere with movement of ships.</td>
</tr>
</tbody>
</table>

**ACCOMMODATION.**

<table>
<thead>
<tr>
<th>Berth</th>
<th>Date</th>
<th>Length (feet)</th>
<th>Depth (feet)</th>
<th>Function of berth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clyde Quay No. 2</td>
<td>1910</td>
<td>550</td>
<td>26</td>
<td>Passenger terminal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>562</td>
<td>28</td>
<td>(proposed)</td>
</tr>
<tr>
<td>Clyde Quay No. 3</td>
<td></td>
<td>455</td>
<td>24</td>
<td>Overseas (gen. cargo)</td>
</tr>
<tr>
<td>Taranaki St. No. 2</td>
<td>1906</td>
<td>360</td>
<td>24</td>
<td>Overseas</td>
</tr>
<tr>
<td></td>
<td></td>
<td>500</td>
<td>27</td>
<td>Trans-Tasman</td>
</tr>
<tr>
<td>Queen's No. 1</td>
<td>1862</td>
<td>887</td>
<td>27</td>
<td>Trans-Tasman</td>
</tr>
<tr>
<td></td>
<td></td>
<td>687</td>
<td>27</td>
<td>Coastal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>455</td>
<td>24</td>
<td>Coastal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>334</td>
<td>19</td>
<td>Coastal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>375</td>
<td>23</td>
<td>Coastal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>500</td>
<td>27</td>
<td>Coastal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>265</td>
<td>18</td>
<td>Coastal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>404</td>
<td>21</td>
<td>Coastal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>262</td>
<td>14</td>
<td>Coastal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>161</td>
<td>14</td>
<td>Coastal</td>
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<tr>
<td></td>
<td></td>
<td>164</td>
<td>14</td>
<td>Coastal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>205</td>
<td>16</td>
<td>Coastal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>299</td>
<td>14</td>
<td>Coastal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>227</td>
<td>16</td>
<td>Coastal (reserved for Nelson service)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>501</td>
<td>14</td>
<td>Coastal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>524</td>
<td>23</td>
<td>Coastal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>162</td>
<td>14</td>
<td>Coastal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>524</td>
<td>23</td>
<td>Coastal</td>
</tr>
<tr>
<td>Waterloo Quay No. 1</td>
<td>1882</td>
<td>175</td>
<td>22</td>
<td>Coastal/small overseas</td>
</tr>
<tr>
<td></td>
<td>1882</td>
<td>(originally Wool Wharf) 352 + 197</td>
<td>22</td>
<td>Coastal/small overseas</td>
</tr>
<tr>
<td></td>
<td>1879</td>
<td>166</td>
<td>16</td>
<td>Coastal</td>
</tr>
<tr>
<td>Inter-Island No. 1</td>
<td></td>
<td>166</td>
<td>16</td>
<td>Coastal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>166</td>
<td>16</td>
<td>Coastal (passenger)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>605</td>
<td>26</td>
<td>Coastal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>705</td>
<td>28</td>
<td>Coastal</td>
</tr>
<tr>
<td>Glasgow No. 1</td>
<td>1901</td>
<td>271</td>
<td>16</td>
<td>Overseas (Export)</td>
</tr>
<tr>
<td>Berth</td>
<td>Date</td>
<td>Length feet</td>
<td>Depth feet</td>
<td>Function of Berth</td>
</tr>
<tr>
<td>------------------------------</td>
<td>--------</td>
<td>-------------</td>
<td>------------</td>
<td>--------------------------------</td>
</tr>
<tr>
<td>Glasgow No. 2</td>
<td></td>
<td>720</td>
<td>32</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>760</td>
<td>33</td>
<td>Overseas</td>
</tr>
<tr>
<td>King's No. 1</td>
<td>1909</td>
<td>281</td>
<td>16</td>
<td>Overseas</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>822</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>787</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>Pipitea Quay No. 1</td>
<td>1923</td>
<td>303</td>
<td>18</td>
<td>Overseas</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>764</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>948</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>Fryatt Quay No. 1</td>
<td></td>
<td>1,440</td>
<td>25</td>
<td>Overseas (steel and hardwoods)</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aotea Quay No. 1</td>
<td>1928/40</td>
<td>3,380</td>
<td>35</td>
<td>Overseas</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>3,680</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>Dock Wharf</td>
<td></td>
<td>527</td>
<td>33</td>
<td>Overseas (tanker)</td>
</tr>
<tr>
<td>Petone Wharf</td>
<td>1907/8</td>
<td>363</td>
<td>14</td>
<td>Coastal</td>
</tr>
<tr>
<td>Point Howard</td>
<td>1929</td>
<td>520</td>
<td>34</td>
<td>Overseas (tanker)</td>
</tr>
<tr>
<td>Burnham</td>
<td>1927</td>
<td>841</td>
<td>30</td>
<td>Overseas (tanker)</td>
</tr>
<tr>
<td>Miramar E.</td>
<td>1901</td>
<td>420</td>
<td>23</td>
<td>Overseas (oil and bunkering)</td>
</tr>
<tr>
<td>Miramar W.</td>
<td></td>
<td>562</td>
<td>34</td>
<td></td>
</tr>
</tbody>
</table>

Transport on wharves:— Principally rail.
Transit sheds:— Storage capacity 73,400 tons.

METHODS OF LOADING AND DISCHARGING.
Wharf cranes and ship's gear.

LABOUR. 1,800 (registered).

DEVELOPMENTS.
A new passenger terminal now under construction will free berths for cargo.
New sheds are under construction and wharf is being reconstructed.
PICTON
(Fig.70, Plate XXXI)

ADMINISTRATION.

Harbour Board :- Marlborough Harbour Board.
Established :- 1958
Number of members: - 11
Electoral area :- Blenheim, Picton, Awatere County, Kaikoura and East Coast, Marlborough County and Sounds County.

NAVIGATIONAL FEATURES.

Tidal range :- 1.8 ft. (N) 4.6 ft. (S).
Nature and depth of entrance channel: - Natural harbour. Width 6,000 ft., depth 150 ft.
Amount of annual maintenance dredging: - None.
Wind and wave action: - Well protected. Local gusts from high land. Swell no problem.
Tidal rate: - W. entrance 1/3 knots, E. entrance 5/7 knots, N.E. entrance 3/1 knot.

ACCOMMODATION.

No. of berths :- 3
Total berthage :- 2,084 ft.

<table>
<thead>
<tr>
<th>Berth</th>
<th>Date</th>
<th>Length feet</th>
<th>Depth feet</th>
<th>Function of berth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waiochi E</td>
<td>1912</td>
<td>792</td>
<td>19-37</td>
<td>Overseas/Coastal</td>
</tr>
<tr>
<td>W</td>
<td>1912</td>
<td>792</td>
<td>10-37</td>
<td>Overseas/Coastal</td>
</tr>
<tr>
<td>Ferry Terminal</td>
<td>1962</td>
<td>500</td>
<td>22-32</td>
<td>Coastal/rail ferry.</td>
</tr>
</tbody>
</table>

Transport on wharves: - Road and rail.
Transit sheds: - 1,800 sq.ft.

METHODS OF LOADING AND DISCHARGING.

Ship's gear. Ferry terminal permits railway wagons to roll on and roll off.

LABOUR. 50 (registered).

DEVELOPMENTS.

None scheduled.
NELSON
(Fig. 71, Plate XXXII)

ADMINISTRATION.

Harbour Board: Nelson Harbour Board.
Established: 1901.
Number of members: 10.
Electoral area: City of Nelson, Richmond County, Waimea County.

NAVIGATIONAL FEATURES.

Tidal range: 5 ft./6 ft.(N) 1 3/4 ft.(S).
Nature and Depth of entrance channel: Natural harbour, constricted: top width 350 ft., bottom width 250 ft.
Amount of annual maintenance dredging: None - only capital dredging.
Wind and wave action: Open to N, N.E. winds. N. winds produce sand in harbour - associated with spring tides.
Tidal rate: 3/4 knots (N) 5/6 knots (S).
Restrictions on entry of shipping: Narrow and shallow entrance.
Draught restrictions at neap tides 22 ft. and at spring tides 24 ft. Entering and departing overseas ships governed by draught and stages of trade.

ACCOMMODATION.

No. of berths: 12.
Total berthing: 3,143 ft.

<table>
<thead>
<tr>
<th>Berth</th>
<th>Date</th>
<th>Length feet</th>
<th>Depth feet</th>
<th>Function of berth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main</td>
<td>1876</td>
<td>464</td>
<td>12</td>
<td>Overseas</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>885</td>
<td>20</td>
<td>Overseas (tanker)</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td></td>
<td>24</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>284</td>
<td>29</td>
<td>Coastal</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td></td>
<td>18</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breastwork</td>
<td>8</td>
<td>(490)</td>
<td>14</td>
<td>Coastal</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td></td>
<td>9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>100</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>McGlashen</td>
<td>1959/64</td>
<td>940</td>
<td>26</td>
<td>Overseas</td>
</tr>
</tbody>
</table>

Transport on wharves: Road only.
Transit sheds: 20,200 sq. ft.
Cool stores for 32,000 cases of apples.

METHODS OF LOADING AND DISCHARGING CARGO.

Ship's gear and fork lift trucks.

LABOUR. 100 (registered).

DEVELOPMENTS.

Character: Dredging is to be put in hand to enable ships to load to 26 ft. at neap tide and 28 ft. at spring tide. The McGlashen Quay is being extended and a new transit shed will be completed.
Aim: To handle larger ships and more trade.
WESTPORT
(Fig. 72, Plate XXXIII)

ADMINISTRATION. In hands of Marine Department. Harbour Board went bankrupt in 1920. Affairs of port handled by Port Advisory Committee and representative of Marine Department.

NAVIGATIONAL FEATURES.

Tidal range : 5½ ft. (N) 9½ ft. (S).
Nature and depth of entrance channel: River port, bar at mouth-depth 11-12 ft. when bar in good condition - shoals to 6 ft. Width 630 ft.
Amount of annual maintenance dredging: Dredge in river and on bar.
Wind and wave action: Open to W. wind. Swell severe in N.W. or when river in flood.
Tidal rate: FRESHES in river can reach 8/10 knots.
Restrictions on entry of shipping: Vessel length 432 ft. Beam no limit.

ACCOMMODATION.

No. of berths : 7
Total berthing : 2,900 ft.

<table>
<thead>
<tr>
<th>Berth</th>
<th>Date</th>
<th>Length feet</th>
<th>Depth feet</th>
<th>Function of berth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crane 1</td>
<td>1896/1917</td>
<td>2200</td>
<td>20</td>
<td>Overseas/Coastal (Coal and cement)</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Merchandise</td>
<td>1878</td>
<td>700</td>
<td>15-18</td>
<td>Coastal (general and timber)</td>
</tr>
<tr>
<td>Staithes</td>
<td>1876/8</td>
<td></td>
<td></td>
<td>Not used since 1916.</td>
</tr>
</tbody>
</table>

Transport on wharves: Rail.
Transit sheds : 5,100 sq.ft.

METHODS OF LOADING AND DISCHARGING.
Steam and electric cranes, ship's gear.

LABOUR. 60 (registered).

DEVELOPMENTS.
Extension to breakwater to increase draughts on bar.
GREYMOUTH
(Fig.73, Plate XXXIV)

ADMINISTRATION.

Harbour Board :- Greymouth Harbour Board.
Established :- 1884
Number of members :- 9
Electoral area :- Inangahua County, Greymouth, Grey County and Westland County north of Waiho River.

NAVIGATIONAL FEATURES.

Tidal range :- 5 ft. (N) 9 ft. (S).
Amount of annual maintenance dredging :- Local shoaling at berthages and in navigation channel.
Wind and wave action :- S.W. wind and swells problem. Ships delayed 22 hours on average.
Tidal rate :- 1½ knots (N) 2 knots (S).
Restrictions on entry of shipping :- Maximum length 320 ft. with 18 ft. 6 in. forward. Bar critical factor - need to allow 3 ft. for swell.

ACCOMMODATION.

No. of berths :- 8
Total berthage :- 4,115 ft.

<table>
<thead>
<tr>
<th>Berth</th>
<th>Date</th>
<th>Length feet</th>
<th>Depth feet</th>
<th>Function of berth</th>
</tr>
</thead>
<tbody>
<tr>
<td>River 1</td>
<td>1866</td>
<td>2243</td>
<td>17-20</td>
<td>Coastal</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>1894</td>
<td>872</td>
<td>10</td>
<td>Coastal</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>1900</td>
<td>1000</td>
<td>9-17</td>
<td>Dredge</td>
</tr>
<tr>
<td>Lagoon</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Transport on wharves :- Rail.
Transit sheds :- 3,600 sq.ft.

METHODS OF LOADING AND DISCHARGING.

Electric cranes.

LABOUR. 94 (registered).

DEVELOPMENTS.

None scheduled.
LYTTELTON
(Fig. 74, Plate XXXV and XXXVI)

ADMINISTRATION.

Harbour Board: - Lyttelton Harbour Board.
Established: - 1877
Number of members: - 13

NAVIGATIONAL FEATURES.

Tidal range: - 5 ft. (N) 7 ft. (S).
Nature and depth of entrance channel: - Natural harbour, width 500 ft, dredged channel 32 ft.
Amount of annual maintenance dredging: - Dredge channel (to 32 ft.) and inner harbour (to 36 ft.).
Wind and wave action: - S.W. gales draw out with great violence. Outer part of harbour subject to considerable swell.
Tidal rate: - ½ - ¾ knots.
Restrictions on entry of shipping: - No berthing in hours of darkness.

ACCOMMODATION.

No. of berths: - 17
Total berthage: - 10,338 ft.

<table>
<thead>
<tr>
<th>Berth</th>
<th>Date</th>
<th>Length (feet)</th>
<th>Depth (feet)</th>
<th>Function of berth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gladstone Pier</td>
<td>1879</td>
<td>1094</td>
<td>37</td>
<td>Overseas (bulk discharge)</td>
</tr>
<tr>
<td>No.1 Breastwork</td>
<td>1879</td>
<td>685</td>
<td>26</td>
<td>Overseas/coastal</td>
</tr>
<tr>
<td>2</td>
<td>1877</td>
<td>886</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1877</td>
<td>641</td>
<td>24</td>
<td>Inter-island ferry</td>
</tr>
<tr>
<td>4</td>
<td>1881</td>
<td>424</td>
<td>31</td>
<td>Overseas/coastal</td>
</tr>
<tr>
<td>6</td>
<td>1887</td>
<td>517</td>
<td>29</td>
<td>Overseas/coastal</td>
</tr>
<tr>
<td>5</td>
<td>1897</td>
<td>509</td>
<td>35</td>
<td>Overseas</td>
</tr>
<tr>
<td>7</td>
<td>1897</td>
<td>509</td>
<td>35</td>
<td>Overseas</td>
</tr>
<tr>
<td>Oil wharf</td>
<td></td>
<td>664</td>
<td>35</td>
<td>Lay up berth</td>
</tr>
<tr>
<td>Cashin Quay</td>
<td>1964</td>
<td>3500</td>
<td>22</td>
<td>Under construction</td>
</tr>
</tbody>
</table>

Transport on wharves: - Principally rail.
Transit sheds: - Goods handled by railway transit sheds in Christchurch.

METHODS OF LOADING AND DISCHARGING.

Wharf cranes and ship's gear.

LABOUR. 725 (registered).

DEVELOPMENTS.

Character: - A quay of 3,500 ft. is under construction and will be equipped with transit sheds, rail tracks and cranes. It is also proposed to redesign the inner harbour.
Aim: - To provide extra berthing space for overseas vessels.
TINARU
(Fig.75, Plate XXXVII)

ADMINISTRATION.

Harbour Board :- Timaru Harbour Board.
Established :- 1877
Number of members:- 14
Electoral area :- Counties of Geraldine, Levels, Mackenzie and part of Waimate including all boroughs and cities in these areas.

NAVIGATIONAL FEATURES.

Tidal range :- 4½ ft. (N) 5½ ft. (S).
Amount of annual maintenance dredging:- Longshore drift and insilting of harbour basin require continual dredging.
Wind and wave action:- E. and S. winds generate waves outside entrance. Considerable difficulties in N.W. winds.
Tidal rate :- ¾ knot (N) 1 knot (S).
Restrictions on entry of shipping:- Maximum size of vessel 600 ft., beam 80 ft. Maximum draught 26 ft. 6in.

ACCOMMODATION.

No. of berths :- 6
Total berthage :- 5,350 ft.

<table>
<thead>
<tr>
<th>Berth</th>
<th>Date</th>
<th>Length feet</th>
<th>Depth feet</th>
<th>Function of berth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main No. 1 E Extension</td>
<td>1878</td>
<td>1060</td>
<td>30</td>
<td>Overseas/tanker</td>
</tr>
<tr>
<td>No. 2 S N</td>
<td>1885-1905</td>
<td>880</td>
<td>32</td>
<td>Overseas/tanker</td>
</tr>
<tr>
<td>No. 3 S N</td>
<td>1910</td>
<td>520</td>
<td>28</td>
<td>Coastal/overseas</td>
</tr>
<tr>
<td></td>
<td>500</td>
<td>28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ballast</td>
<td>1890</td>
<td>642</td>
<td>30</td>
<td>Coastal/Overseas</td>
</tr>
<tr>
<td>Fish wharf</td>
<td></td>
<td>642</td>
<td>30</td>
<td>Not in commercial use.</td>
</tr>
</tbody>
</table>

Transport on wharves:- Principally rail.
Transit sheds :- No transit sheds on wharf. Goods sorted by Railways Department.

METHODS OF LOADING AND DISCHARGING.

Ship's gear. Mechanical meat loaders are also being installed.

LABOUR. 225 (registered).

DEVELOPMENTS.

Character:- Additional transit sheds will shortly be built. The channel is at present being dredged to give greater depth. Reclaiming 14 acres of land for transit sheds.
Aim:- Faster turn-round.
Oamaru
(Fig. 76, Plate XXXVIII)

ADMINISTRATION.

Harbour Board: - Oamaru Harbour Board.
Established: - 1874.
Number of members: - 9.
Electoral area: - Oamaru Borough, part of Waitaki and Waimate Counties.

NAVIGATIONAL FEATURES.

Tidal range: - 5 ft. (N) 7 ft. (S).
Nature and depth of entrance channel: - Breakwater harbour, width 600 ft.
(working width 525 ft.) depth 17 ft.
Amount of annual maintenance dredging: - Silting in harbour and shoaling
active inner side of outer breakwater.
Wind and wave action: - Affected by S. and E. seas. Winds from E. produces
considerable swell.
Tidal rate: -
Restrictions on entry of shipping: - Maximum permissible vessel length 500 ft,
no beam restriction. Maximum draught 17 ft. Entry unsafe when heavy S.E.
swell is running across entrance.

ACCOMMODATION.

No. of berths: - 4.
Total berthage: - 1,770 ft.

<table>
<thead>
<tr>
<th>Berth</th>
<th>Date</th>
<th>Length feet</th>
<th>Depth feet</th>
<th>Function of berth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Holmes</td>
<td>1907</td>
<td>900</td>
<td>22</td>
<td>Coastal (tanker)</td>
</tr>
<tr>
<td>Sumpter</td>
<td>1884</td>
<td>500</td>
<td>14-16</td>
<td>Standby for coastal vessels</td>
</tr>
<tr>
<td>Normanby</td>
<td>1878</td>
<td></td>
<td>12</td>
<td>Not used for commercial purposes.</td>
</tr>
<tr>
<td>Cross</td>
<td>1879</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Macindrew</td>
<td>1875</td>
<td>330</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Transport on wharf: - Principally rail.
Transit sheds: - None on wharf. Handled by Railway.

METHODS OF LOADING AND DISCHARGING.

Ship's gear.

LABOUR. 45 (registered).

DEVELOPMENTS.

None scheduled.
OTAGO
(Fig. 77 and 78, Plates XXXIX and XL)

ADMINISTRATION.

Harbour Board :- Otago Harbour Board.
Established :- 1874.
Number of members :- 12.
Electoral area :- City of Dunedin, Boroughs of St. Kilda, Port Chalmers and West Harbour. Counties of Taieri, Bruce, Clutha, Vincent, Maniototo, Waihemo, Waikowiti Peninsula and boroughs enclosed in counties. The port is conveniently considered in two parts:-

1. DUNEDIN.

NAVIGATIONAL FEATURES.

Tidal range :- 4 ft. 2 in. (N) 5 ft. 7 in. (S).
Nature and depth of entrance channel :- Natural harbour. Victoria Channel 24 ft. depth; 200 ft. wide.
Amount of annual maintenance dredging :- Dredge in Victoria Channel constantly to maintain 24 ft. depth.
Wind and wave action :-
Tidal rate :- 2-2½ knots (N) 2-3 knots (S).
Restrictions on entry of shipping :- Maximum permissible vessel length 540 ft., beam 72 ft., draught 25 ft.

ACCOMMODATION.

No. of berths :- 9.
Total berthage :- 6,154 ft.

<table>
<thead>
<tr>
<th>Berth</th>
<th>Date (a)</th>
<th>Length (feet)</th>
<th>Depth (feet)</th>
<th>Function of berth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Victoria</td>
<td>1883-86</td>
<td>1970</td>
<td>25</td>
<td>Overseas (oil jetty)</td>
</tr>
<tr>
<td>Rattray</td>
<td>1878</td>
<td>1420</td>
<td>25</td>
<td>Overseas</td>
</tr>
<tr>
<td>Cross</td>
<td>1879</td>
<td>600</td>
<td>21</td>
<td>Coastal</td>
</tr>
<tr>
<td>Birch St.</td>
<td>Rebuilt 1938-40</td>
<td>1130</td>
<td>25</td>
<td>Overseas</td>
</tr>
<tr>
<td>Kitchen St.</td>
<td>1911</td>
<td>650</td>
<td>22</td>
<td>Coastal, Trans-Tasman</td>
</tr>
<tr>
<td>Ravensbourne</td>
<td>1929</td>
<td>384</td>
<td>25</td>
<td>Overseas (bulk phosphates)</td>
</tr>
</tbody>
</table>

(a) Date of oldest surviving section of wharf.

Transport on wharves :- Road and rail.
Transit sheds :- 2,887,718 cu. ft.

METHODS OF LOADING AND DISCHARGING.

Ship's gear and wharf cranes.

LABOUR. 550 Dunedin and Port Chalmers (registered).

DEVELOPMENTS.

The Victoria Wharf is to be widened and new transit sheds and cranes are to be provided.

2. PORT CHALMERS.

NAVIGATIONAL FEATURES.

Tidal range :- 4 ft. 2 in. (N) 5 ft. 7 in. (S).
Nature and depth of entrance channel :- Depth 34½ ft. Sandy bottom.
Amount of annual maintenance dredging :- Continuous dredging in channel.
Wind and wave action:-- N.W. winds raise choppy seas. Light S.E. winds (accompanied by sea fog) result in confused swell.

Tidal rate:-- 2½ knots.

Restrictions on entry of shipping:-- Vessels requiring over 26 ft. draught have to wait for suitable tide. Maximum vessel length 800 ft, beam 90 ft, draught 32 ft.

ACCOMMODATION.

No. of berths:-- 3
Total berthage:-- 2,440 ft.

<table>
<thead>
<tr>
<th>Berth</th>
<th>Date</th>
<th>Length Feet</th>
<th>Depth Feet</th>
<th>Function of berth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bowen</td>
<td></td>
<td>700</td>
<td>32</td>
<td>Demolished</td>
</tr>
<tr>
<td></td>
<td>S</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>George St.</td>
<td>1870-</td>
<td>800</td>
<td>32</td>
<td>Overseas</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>S</td>
<td>940</td>
<td>32</td>
<td>Overseas</td>
</tr>
</tbody>
</table>

Transport on wharves:-- Rail.
Transit sheds:-- No transit sheds on wharf.

METHODS OF LOADING AND DISCHARGING.

Ship's gear and wharf cranes.

LABOUR. (See Dunedin).

DEVELOPMENTS.

A new export and import wharf with sheds and fitted with cranes is under construction and will provide for both rail and road transport.
BLUFF
(Fig. 79, Plate XLI and XLII)

ADMINISTRATION.

Harbour Board: Southland Harbour Board.
Established: 1877
Number of members: 12
Electoral area: Invercargill City; Boroughs of Gore, Mataura, Lumsden, Riverton, Arrowtown, Queenstown; and Southland, Wallace, Lake Counties (including townships).

NAVIGATIONAL FEATURES.

Tidal range: 5-6 ft. (N) 7-9 ft. (S).
Least depth in fairway 23 ft.
Amount of annual maintenance dredging: Suction dredge for new berthing.
Wind and wave action:
Tidal rate: 3-4 knots (N) 5-7 knots (S).
Restrictions on entry of shipping: Maximum size for entering port 600 ft., beam no limit. Maximum draught at H.W. 29 ft.6 in. Ships handled at slack water. In frequent fogs spring and autumn.

ACCOMMODATION.

No. of berths: 10
Total berthage: 4,037 ft.

<table>
<thead>
<tr>
<th>Berth</th>
<th>Date</th>
<th>Length feet</th>
<th>Depth feet</th>
<th>Function of berth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1876</td>
<td>1812</td>
<td>29.5</td>
<td>Tanker/overseas</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>1812</td>
<td>27.5</td>
<td>Tanker/overseas</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>1812</td>
<td>27.5</td>
<td>Bulk cargo/overseas</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td>24.5</td>
<td></td>
</tr>
<tr>
<td>Ferry</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1920</td>
<td>1000</td>
<td>23</td>
<td>Coastal</td>
</tr>
<tr>
<td>New wharves</td>
<td></td>
<td></td>
<td></td>
<td>Coastal Trans-Tasman</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>1225</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>1225</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Transport on wharves: Road and rail.
Transit sheds: 61,800 sq.ft.
Off-shore store 12,620 sq.ft.

METHODS OF LOADING AND DISCHARGING.

Ship's gear. Meat is loaded by mechanical all weather loaders.

LAbOUR: 380 (registered).

DEVELOPMENTS.

New scheme completed. None scheduled.
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A Selection of the Major Sources

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   (a) Theses.
   (b) Other unpublished material.

2. GOVERNMENT PAPERS
   (a) To 1853.
   (b) General Government since 1854.
   (c) Provincial Government, 1853-76.

3. STATISTICAL SOURCES
   (A) New Zealand Government Statistics.
      (a) General Statistics.
      (b) Specific Statistics.
         (i) Agricultural and Pastoral.
         (ii) Industrial Production.
         (iii) Population.
         (iv) Transport.

   (B) Other Sources.

4. REPORTS
   (a) Annual.
   (b) Special.

5. PERIODICAL ARTICLES

6. NEWSPAPERS

7. BOOKS AND PERIODICALS

8. OTHER SOURCES
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(a) Theses (in Geography unless otherwise stated).


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  D-5 National Roads Board
  H-15 Marine Department
  H-40 Transport Department
  H-44 Department of Industries and Commerce
  H-45 Waterfront Industry Commission

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