

Capital formation in transport infrastructure in New Zealand to 1950

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Series of disaggregated capital formation in the New Zealand public sector prior to 1950 remain scarce despite thirty years having passed since the series for the period 1871–1900 were compiled by J.A. Dowie. Even within his series there can be problems utilizing the estimates because of the aggregated nature of some outlay categories. The capital stock series are more deficient, reflecting methodological problems with the preparation of such series from capital formation data. Using the Dowie series as a point of reference this article focusses on one important area of public capital stock, transport infrastructure. The resulting estimates allow some exploration of public policies in respect of the provision of transport infrastructure.

The expansion and improvement of transport networks has been an integral part of New Zealand's progression from an undeveloped resource-based economy to a modern industrial state. Many commentators would assign an important role in the development process to the provision of adequate stocks of transport infrastructure and in recent times there has been renewed interest in the estimation of their contribution to economic growth. Despite this, the pattern of infrastructural development in New Zealand has not been given the attention it would appear to deserve and its importance has been an assumption rather than the outcome of critical assessment. In between general discussions of the broad impact of infrastructure trends on regional development and articles on specific issues there lies much untouched ground. This article is a mixture of both, being a general discussion of specific aspects of transport infrastructural formation.¹

Australian Economic History Review, XXXVI, No. 2 (September 1996), edited by G.D. Snooks and G. Whitwell. © Economic History Society of Australia and New Zealand.

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¹ Watters, *Land and society*, is a useful place to begin in a study of transport development in the period up to 1950 as well as a useful illustration of the style

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Contributing to this deficiency in transport history is the absence of infrastructural data, and one of the functions of this article is to present estimates of capital outlays from 1840 to 1950 in the three largest transport infrastructure sectors, namely railways, roads, and harbours. That series have not been compiled is not the result of a lack of primary data, since transport infrastructure has largely been provided by the public sector, and there are extensive records of transport outlays as far back as the annexation of New Zealand by Britain in 1840. For much of the nineteenth century the primary material is subject to problems in respect of functional classification and the purpose of an earlier paper on this subject was to introduce methods by which more precise classification could be made of the public capital data.²

Capital series for transport infrastructure were included in Dowie's private and public capital series for 1871–1900.³ Within this work there were problems with some of the public sector estimates: in particular, it was not possible to assign functional classifications to the highly aggregated local government capital formation outlays. Series for capital stock were more deficient, reflecting Dowie's concern with the methodological preparation of such series from capital formation data. This article builds upon the Dowie series in three ways: (i) by utilizing disaggregated local government transport infrastructure outlays; (ii) by extending the capital formation series back from 1871 and through to 1950; and (iii) by refining estimates for public capital stock in transport infrastructure.

1 Estimates and methods

This article deals with the infrastructure of the three largest transport sectors, the rail, road, and harbour sectors, from 1840 to 1950. In order to present estimates of transport infrastructure that are comparable across the three sectors, estimates are restricted to expenditures associated with the construction, extension, and improvement of what would be termed 'permanent way' in the case of road and rail infrastructure and 'permanent structures' in the case of harbour works, thus excluding outlays associated with working operations. All capital estimates are aggregate, that is, plant and equipment are not estimated separately from structures, but it is assumed that outlays are predominantly for the latter.

of the general study. The most popular specific issue in transport research prior to 1950 was intra-sectoral competitiveness: see *Economic Record*, vol. 19, 1939, p. 166, for a bibliography. Useful contributions that critically analyse specific issues within a broader background include Dowie, 'Business politicians', on railway construction policy in the period 1870–1880, and the discussion of regional trends of harbour infrastructure based on trade data in Johnston, *Urbanisation*.

² Mulcare, 'Gross capital formation'.

³ Dowie, 'Capital formation'.

The concept of capital used is gross capital outlay from 'flow-of-funds'. Capital stock series are estimated according to the perpetual inventory method which cumulates real net gross capital formation:

$$GK_t^i = GK_{t-1}^i + GI_t^i - R_t^i \quad (1)$$

GK_t^i = gross capital stock of asset i at time t

GI_t^i = gross investment in i during t

R_t^i = retirements of i during t

all of the above expressed in real prices.

In the absence of benchmark stock estimates the requirements for the model are therefore: (i) gross capital formation series from initial formation; (ii) price indexes relevant to the sector; and (iii) information on asset retirement.

The gross capital formation series and price indexes for road and harbour infrastructure for the period 1846–1950 were presented in an earlier paper by the author.⁴

The estimates of railway net capital formation did not present a problem as there are complete series for central government line construction from 1880, at which time an inventory of capital expenditure on public railways by type of outlay was made. The value of this construction in March 1880 minus rolling stock and land purchase was allocated over the period 1871–80 according to the trend of the Dowie aggregate series, that is, inclusive of rolling stock for this period. Prior to 1871 no direct expenditure on railways had been undertaken by the central government. Provincial government outlays from 1871 to 1876 were taken from Dowie, 'Capital formation'. Provincial government construction data from 1867 to 1871 can be found in *Statistics of the Dominion of New Zealand*, while for lines prior to 1867 contract or purchase prices were used, and when these were not available an estimate based on the construction costs implied by these and similar lines was calculated.⁵ To the expenditure on new construction from the public works fund from 1880 were added additions to open lines by the ways and works branch. From 1904 these outlays were supplemented by improvements and additions to special sections, the most substantial being expenditure under the *Improvement Authorisation Act* of 1914, and further amendments to this Act in 1924, 1925, and 1926. Land purchase data were available from a 1925 Railway Commission

⁴ Minor differences exist between the series in the Appendix and that in Table 1 of Mulcare, 'Gross capital formation', and this information is available from the author on request.

⁵ NZ, *Appendix*, 1873, E-7a, p. 17; NZ, *Appendix*, 1877, I-2D, pp. 2–4; NZ, *Yearbook*, 1963, pp. 1175–6. The fact that all but one line were a different gauge from the standard adopted implies that railway net capital formation in the 1870s is probably overstated.

report:⁶ this was allocated evenly over the period 1880–1925 and deducted from new construction, with the implied weight of land purchase in line construction used as a deduction for the period 1925–49. Lines not owned by the Railway Department were incorporated into the series in their year of transfer according to their purchase price.⁷

A price series for railways for the period 1871–1910 has been prepared by Dowie, and for the period 1863–70 the price of railway construction inputs was assumed to follow the same pattern as was estimated for roading. From 1910 the building and construction index prepared by Francis was spliced onto the Dowie series.⁸

Information on retirement is generally the most problematic area of perpetual inventory models, but the distinction between outlays best allocated to capital expenditure and that best allocated to current expenditure will be more blurred than usual with the assets in question. This is exacerbated by the procedure for estimating roading gross capital formation prior to 1900.⁹ For this reason, the fact that the expected asset life of much of the important structures within the transport sector implies a trivial level of replacement before 1925, and that prior to 1925 at least one sector (railways) explicitly undertook *all* replacement out of maintenance, more attention was given to post-1924 retirement.

Retirement of harbour and road assets is taken from Mulcare, 'Gross capital formation', with the estimation of railway asset retirement being similar to that undertaken for road assets here.¹⁰ Railways Department annual returns give information on the value of track renewal each year, this being recorded as a subset of maintenance on ways and works. From 1926 replacement of bridges out of the floods, etc. reserve account could be added to this. Replacement of bridges other than that out of this account was not available but can be expected to be minimal on the basis of the mean asset lives used for this type of structure in other surveys.¹¹

⁶ NZ, *Appendix*, 1925, D-2a, p. 5.

⁷ Prior to 1925 all replacement was taken out of current expenditure, but as improvements were also not a trivial part of such expenditure and in keeping with the estimates for the other sectors a series for track renewal was compiled which incorporated an improvement index based on the change in rail weight in renewal.

⁸ Dowie, *Studies*, p. 45; Francis, 'Capital formation', p. 28.

⁹ See Mulcare, 'Gross capital formation', pp. 5–6, for estimation of roading GCF, and pp. 9–12 for a discussion of conceptual and empirical issues concerning the retirement estimation of the assets in question.

¹⁰ See Mulcare, 'Gross capital formation', pp. 7–8.

¹¹ Seventy-five years is the average life of bridges implied by other perpetual inventory models. Using a delayed linear mortality function of ± 20 per cent would imply that only bridging constructed prior to 1890 might be retired before 1951 and only in the case of bridging constructed prior to 1875 would more than 50 per cent have been retired by this time.

II The estimates

The estimates of nominal gross capital formation, prices indexes, and real gross capital stocks for each sector are detailed in the Appendix. The pattern of aggregate real gross capital formation in the period is shown in Figure 1 along with series of real output per head and real current government revenue. Disaggregated real gross capital stocks can be found in Figure 2.

Figure 1 illustrates a tendency for annual infrastructure outlays to mirror aggregate activity from the 1870s following an increase in the power of central as opposed to provincial government.¹² Progress up until this time was minimal despite the boost to the 1860s economy from localized gold rushes which were a large factor in the European population increasing from under 100,000 at the end of 1861 to around 250,000 by the end of the decade. The increased demand for transport infrastructure in urban areas was largely satisfied by provincial governments using both their own sources of funds and those of the central government, but the ability of the dominant water-borne transport to service an expanding agricultural hinterland was restricted by the poor quality of inland water routes. By the end of the 1860s the inadequate state of transport infrastructure was but one of several areas in which the constraints of government by province were being seen, and a confluence of events saw the commencement in 1870 of a national development plan, underpinned by a programme of public works financed by British capital raised by the central government.¹³ A boom in the mid-1870s associated with the works programme masked falling prices for the producers of the economy's sole staple product, wool, and the widespread onset of depression by the end of this decade did not greatly constrain infrastructural spending until the second half of the 1880s. A return to favourable terms of trade in the last half of the 1890s and the development of new staples dependent upon refrigeration technology brought with it renewed demand for land transport as intensification of land use increased. By the end of the first decade of the new century this process and the continued expansion of incomes in New Zealand that drove it were slowing, but the commencement of the first of the world wars exacerbated the pro-cyclical pattern of infrastructural expenditure evident up until the Second World War.¹⁴ In times of crisis transport infrastructure was one area of

¹² Output estimates to 1918 use Rankin, 'Gross national product'. From 1918 Easton's 'GDP deflator' is used. The two are calibrated so as to make the comparison with GCF easier. Similarly, the government revenue variable (revenue from the consolidated fund) has a different base from that of real GCF.

¹³ See Oliver and Williams, *Oxford history*, pp. 99–105. The use of different gauges by the few provinces that had constructed railways prior to 1870 has been cited as indicating the imperative for centrally administered railways.

¹⁴ Note that the infrastructural peaks of 1886, 1895, and 1908 are generated by the purchase by the central government of private and other public lines.

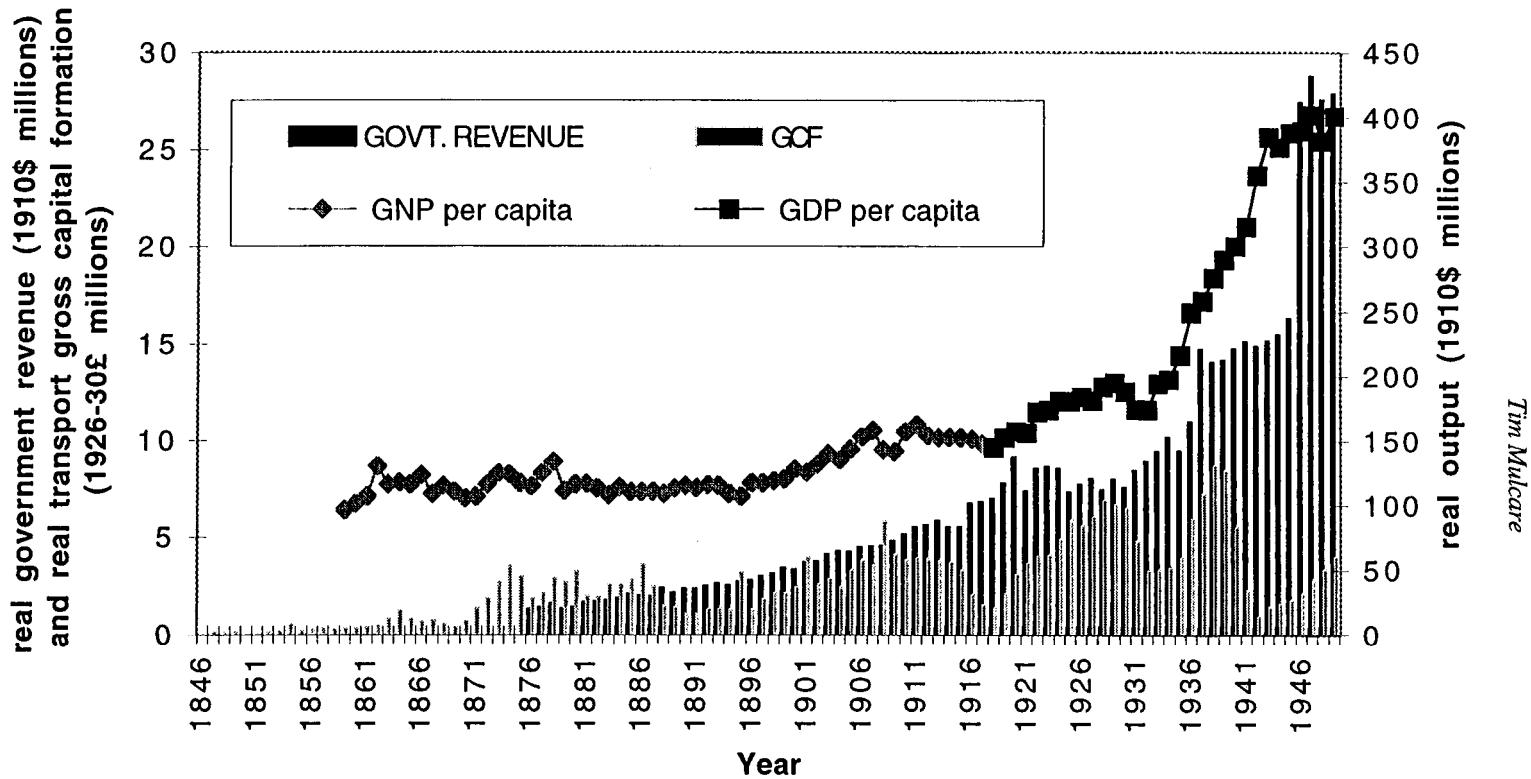


Figure 1. Real gross public capital formation in transport infrastructure compared with real government revenue and real output per capita, New Zealand, 1846–1950

Source: Table 1–2; Easton, ‘GDP deflator’; Rankin, ‘Gross national product’; NZ, *Appendix*.

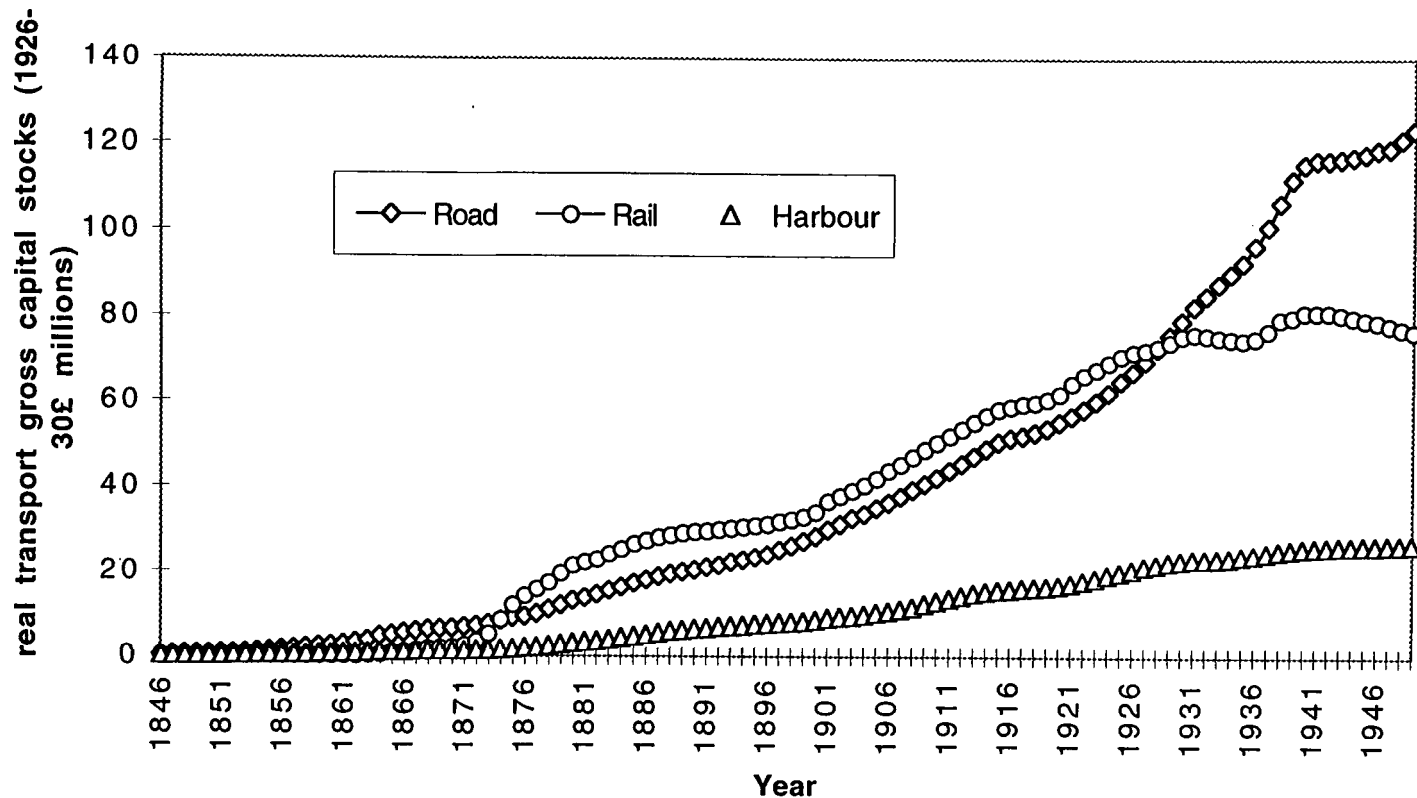


Figure 2. Real gross transport infrastructure capital stocks, New Zealand, 1846–1950

Source: Table 3.

government expenditure that could be reduced for the sake of more exigent agendas, the important priority during hostilities being to conserve scarce resources for war production and during the Great Depression period being to increase government liquidity.

The main theme of Figure 2 is complementarity in the growth of all sectors for most of the period under investigation. The greater lumpiness of rail capital is accentuated by the two booms in rail development, one in the 1870s and one related to the completion of the main trunk line in the first decade of the twentieth century. The expansion of rail works as part of the overall expansion of public works in the late 1930s briefly reversed the trend of capital reduction in this sector, the most obvious manifestation of which was the closure of 56 miles of branch segments in 1931 and 1932 following a book-value capital write-down of £10.4 million.¹⁵ Road stock growth accelerated from the turn of the century, checked (briefly) during the First World War and again in the Second World War. The interwar period saw more rapid expansion in this sector from both the continuation of capital widening and from a process of capital deepening largely undertaken by the Main Highways Board. The relatively low outlays on harbour stocks underscore the critical role played by sea transport for the transport of goods and passengers throughout the nineteenth century and in the early twentieth century for those parts of the country where land transport lines were poor. Harbour services for many areas were generated without a large initial capital outlay although this was to increase over the course of the twentieth century to accommodate changes in shipping technology.

Figure 2 is useful in qualifying the emphasis that has been placed on the position of railways in the transport sector. Railway infrastructure domination at most occurs in the 1880s as a result of the boom formation of the 1870s but from 1881 a greater expansion in road formation vis-à-vis rail and a consistent formation rate of harbour works implied a convergence in the two land infrastructural stocks from this time. The value of railways infrastructure stock was at most 50 per cent larger than the gross value of road stocks and 25 per cent larger than that of road and harbour stocks combined. Soon after the turn of the century road and harbour stocks together were greater than rail infrastructure stocks. Roading on its own grew from 75 per cent of rail stocks at the turn of the century to surpass it by the end of the 1920s.

III The financing of transport infrastructure to 1925

Transport infrastructure was generally financed by the raising of public loans. Repayment of transport capital was part of the general sinking fund requirements for central and local government debt, but the burden of repayment was not expected to fall fully on the administering body but to

¹⁵ Valentine, 'Aspects', p. 59. Construction on unopened lines was also suspended, although work on most lines was subsequently resumed as a result of a general expansion of public works in 1936.

be partially derived from the indirect benefits of construction.¹⁶ User-pays was the guiding principle for current charges and controlling authorities were expected to fund maintenance and interest largely through taxation, rates, and direct user charges, but the extent to which sectors were able to supplement income from the various sources differed.

This is clearest in the case of road financing, and it is possible that a significant amount of road construction did not ultimately require loan financing. By 1927 the total debt on roads was £29.5 million, of which £16 million was on account of the central government. Central government construction from 1876 to 1927 is estimated at £12.8 million and the rest of the central government debt is accounted for by construction undertaken by the provincial governments (£5.1 million in the period 1853–76). Of the residual debt (£13.5 million), 55 per cent was on account of boroughs, and their level of debt two years later was about the level of the roading gross capital formation that has been estimated to have been undertaken by these authorities to this time. The total capital cost of roading to 1927 is estimated at between £45.2 million and £49 million, which implies that between 33 per cent and 40 per cent of total road construction had either been repaid or had been paid for out of revenue by this time.¹⁷

Much of this can be accounted for by the rural local authorities whose primary concern was roading. County debt in 1929 was 40 per cent of the gross capital formation on roading estimated to have been undertaken by these authorities to this time (£15.4 million), while that of the other important roading authority, roads boards, had a debt in 1929 which represented less than 10 per cent of their estimated total construction (£4 million) to that time. County returns provide only a partial picture, but between 1915 and 1926 data on public works by function and source are detailed. These indicate that, of total road works of £17.1 million in this period, £3.1 million was for construction out of revenue sources and £3.9 million for construction from loans. Of total county receipts at this time of £31.7 million, £2.7 million came from grants for roading, the share of land profits, rents, and royalties resulting from road formation came to £1.7 million, and a further £1.7 million was transferred from the general government current account for rate subsidies. Revenue accounts also indicate that counties and roads boards took the bulk of government grants and other transfers prior to 1915. The funding of roading within

¹⁶ See Dowie, 'Business politicians', p. 51. The position of the railways as stated by the leader of the Reform government in 1925 illustrates the approach to the repayment of debt for public works: 'The Working Railways Department as such is not concerned with the redemption of loans . . . its duty is to see that its assets are so kept up as to always represent value for the capital monies invested therein, and the financial policy of the Department for the future has been decided on this principle'. Railways Department Archives, memo to Auditor-General, R3 25/919/1, dated 10/7/1925.

¹⁷ NZ, *Appendix*, 1930, H-40, pp. 21, 49; Mulcare, *Measurement and implications*, pp. 173, 182, 204, 207, 219.

borough boundaries was, on the other hand, primarily provided for under the borrowing powers of the authorities supplemented by their revenue sources and involved little in the way of central government transfers.¹⁸

Harbour boards appear to have also funded a significant amount of capital works from revenue sources but little of this came from the central government. Until 1927 around one-third of harbour board capital formation had been funded from revenue sources, total indebtedness was 55 per cent of estimated assets, and a sinking fund representing 17 per cent of total loan indebtedness had been accrued. Outlay and revenue accounts from 1900 to 1928 indicate that two-thirds of total board receipts were derived from harbour revenue sources and the bulk of the residual (25 per cent) from loans raised on their own account.¹⁹

At least 13 per cent of total capital expenditure on railway infrastructure to 1924 was funded from the general government current account, and a significant proportion of outlays designated as maintenance could be more strictly treated as capital formation.²⁰ Prior to 1925 railway finance was not kept separate from the Treasury accounts, no reserves were kept for depreciation, and replacement and renewal expenditures were met from working expenses. A separate account for a sinking fund was also not established until this date, although provision for the amelioration of debt on account of the railway was a part of the general public debt sinking fund established under the 1910 *Public Debt Extinction Act*. Neither this Act nor the 1925 *Repayment of the Public Debt Act* substantially altered the arrangements for repayment of railway infrastructural debt.²¹ The separation of accounts in 1925 saw the department relieved of commitments to the general sinking fund, being required instead to establish its own fund and to pay interest on total capital regardless of source. The continued loss on the system saw little in the way of contribution to the sinking fund and by the depths of the Great Depression the department was paying around 37 per cent of the interest charge on capital cost.

¹⁸ NZ, *Statistics*, 1916–28.

¹⁹ NZ, *Statistics*, 1900–28.

²⁰ NZ, *Appendix*, 1925, D-2a, pp. 5–6. The distinction between capital and current expenditures for many capital assets is problematic, but there was a greater tendency for asset replacement and repair to imply asset improvement for New Zealand railways as lighter weight line was replaced by heavier line.

²¹ Memo to Auditor-General, Railways Department Archives, R3 25/919/1, dated 10/7/1925. By 1925 the extent of state indebtedness on account of the railways represented between 20–25 per cent of the total loan account of the central government current account. NZ, *Appendix*, 1925, D-2a, p. 9. Local government sinking fund requirements were more stringent than those of the central government and became more so after 1926.

IV Some determinants of infrastructure construction

New capital formation and capital improvement were generally undertaken by the controlling authority subject to parliamentary approval for the more expensive projects. Railway construction and line design and construction were undertaken by a central government department (the Public Works Department) as was the construction of arterial roads. Until the establishment of the Main Highways Board in 1922 construction of minor rural roads was also undertaken by central government departments, but thereafter was handed over to local authorities for 'care and control'. However, it has been suggested that a considerable amount of this class of work was undertaken by the local authorities themselves.

The primary reason cited for the construction of transport networks in New Zealand, at least to the interwar period, was to assist economic development predominantly in respect of extension of the frontier. At a less general level it is clear that the implications for production and land valuation, and more particular for Crown land, were critical. Conditions existed in New Zealand for overinvestment in transport infrastructure because the Crown was able to borrow on the security of the state rather than on the undertaking *per se*, and was not only the predominant architect of network construction and siting but also held considerable amounts of land for much of the period. Unremunerative sections of inland networks could therefore have additional sources of subsidization over and above those from general government revenue, namely from the profits from land sales and rents and from the cross-subsidization of non-profitable routes by profitable routes.²²

In respect of the opening up of the frontier of production, the road network was more important than the railways. The first reliable physical survey of the road network was undertaken in 1924 and indicated that 45,600 miles of formed road (to not less than dray width) had been constructed to this time, compared with around 3,000 miles of railway. Of this roading 93 per cent was within rural districts and a substantial part was minor roading of poor quality. By 1930 rural roads representing 67 per cent of the formed road network remained unclassified, 30 per cent of the network had no surfacing material upon it and, of the 4 per cent of the network that had a dustless surface, half was in urban areas, although urban roads constituted only 8 per cent of the total network. In 1922, 10 per cent of the network was taken over by the Main Highways Board as

²² See Dowie, 'Capital formation', p. 43, and Hawke, *Making of New Zealand*, p. 81, for a discussion of this issue. The misunderstanding of the redistributive effects of railways funded by land sales did not die with the MacAndrew proposals of 1877 and line proposals were still supported on the basis of their implications for Crown land by 1929 by ministers of public works; see, for example, NZ, *Parliamentary debates*, 1929, vol. 223, p. 1191.

important arterial roads, although with improvements this rose steadily to be 33 per cent of the total network by 1950.²³

An important motive for local authorities to extend roading was the revenue generated from the opening up of rateable land. The debt and capital formation estimates of the boroughs indicate that such revenue was able to cover the capital charge of network extensions, and the extension of the frontier was further assisted by supplementing the funds of rural local authorities with funds from the central government. By the 1920s the expansion of the frontier was drawing to a close, but formed road mileage continued to increase to the mid-1970s but at a rate on average of less than half that of the average growth in formed roads up to 1925.

Harbour construction was also justified on developmental grounds, most noticeably for the facilitation of external trade. Water transport was also the critical mode of transport between population centres inside New Zealand in the nineteenth century, losing its dominance only as the rail network was laid down. The low start-up costs for saltwater highway usage belied its importance and contributed to the regional nature of colonial New Zealand: 27 years after British annexation 112 ports were supporting a population of around 217,000, implying an average undisputed hinterland of only 48 kilometres.²⁴ The process of port development in New Zealand has been discussed elsewhere and was found to follow a similar pattern to that found in other underdeveloped countries, that is, many small scattered ports being replaced by port concentration as land transport links first supported then largely competed with sea transport.²⁵ One result of this was rationalization of harbour assets near the major centres of population where much of the nation's external trade was concentrated and where shipping operators could compete on more favourable terms with the railways in the domestic goods trade. By 1925 over two-thirds of total harbour assets were controlled by 6 of the 41 harbour boards.²⁶

Railways construction and operation in New Zealand was dominated by the central government, although a small part of the network had been originally instigated by private enterprise and through the creation of local railways districts. A developmental role for the railways implied a secondary role for the criterion of line return and led to a direct constraint

²³ In 1950 there was still a further 5,400 miles of bridle ways and 13,600 miles of unformed roads. NZ, *Yearbook*, 1923, Section 14; NZ, *Appendix*, 1925, D-1, p. 110.

²⁴ Johnston, *Urbanisation*, p. 44. Of these ports only twenty-six were classified as overseas ports of entry and thus subject to more than rudimentary infrastructure expenditure.

²⁵ See Johnston, *Urbanisation*, pp. 42–52, for a discussion of New Zealand harbours in the period relevant to this article, and Taffe *et al.*, 'Transport expansion', for the model of transportation development that underlies this discussion.

²⁶ Ville, 'Growth of foreign trade', pp. 79–80; NZ, *Local authorities handbook*, 1926, p. 313.

on the working operations by the imposition of a 'policy rate' ceiling on net profits. This constraint, in conjunction with inadequate provision of reserves for a sinking fund and depreciation, is cited as being the key element in the vulnerability of railway profitability which was quickly exposed by road competition in the 1920s.²⁷ To declining profits were added an increasing real cost of line construction with lower average traffic volumes, all of which acted to slow and finally halt the expansion of the rail network before 1950.²⁸

The estimates can make only a small contribution to the literature on the principal beneficiaries of transport infrastructural investment in New Zealand. Large 'lumpy' public investment in railways ensured that progress here would be analysed more closely than in the other sectors, especially when the widespread adoption of the motor car from around the turn of the century threatened the value of the asset. However, commentators have argued that railway construction, at least in the formative building period, was a constellation of mainly economic imperatives and waste was minimized. There has been some suggestion that the extent of investment in harbour infrastructure was also supra-optimal, but such analysis was undertaken in the light of the completion of a national railways trunk network which was subsequent to the construction of those harbour assets.²⁹

Contemporary analysis was dominated by discussions of regional winners and losers rather than the sectoral interest groups involved. At the broadest level this grouped political protagonists into the North and South Island blocs, but this is usually considered to be the result of the merging of provincial-level interests.³⁰ With the advent of private motor transport and the need for an improved road network, the discussion of winners and losers became more wide-ranging, but at the political level the arguments remained fundamentally unchanged: past recipients of transport funds wanted to reduce the level of subsidization to poorly developed areas and

²⁷ See Dowie, 'Business politicians', pp. 46–8, and Valentine, 'Aspects', pp. 61–2. Valentine considered the 'policy has therefore imposed a permanent handicap on the earning power of the railway' and there was 'little doubt that, from about 1900 until road transport became a serious rival, the railways could have been administered so as to . . . cover all expenses' ('Aspects', p. 62).

²⁸ Valentine, 'Aspects', p. 62, and Neale, 'Railway situation', pp. 1–2, 78. A number of factors further tended to indicate the need for increasing depreciation provision, including the expected length of life of the line and its replacement by heavier rail, as well as an increase in rolling stock redundancy.

²⁹ See Dowie, 'Business politicians', pp. 41–5; Hawke, *Making of New Zealand*, p. 81; Neale, 'Railway situation', pp. 75, 79; and Williams, 'Co-ordination', p. 192.

³⁰ That is, the completion of the North Island railway main trunk in 1908 reinforced a demographic-based northern movement of trade and strengthened the subsidization of southern business by the north.

representatives of these areas agitated for funding in the name of economic development.³¹

On a more general level, political involvement in infrastructural siting might better be described as affecting the timing rather than the pattern of construction and as a gradual process of regional appeasement within the overall policy of construction for development. This was most evident in the case of the railways, and one result of this was for the average real cost of construction to increase over the period. The average capital cost per open mile had increased 30 per cent faster than the CPI from the end of the First World War, and at an average construction cost of £40,000 the lines still in the process of construction were at the top end of construction costs and expected to show an average annual net loss per mile five times that of the average loss on open lines.³² Given the agricultural and island nature of New Zealand, the connection between terrain costs and line return is to be expected, but this was exacerbated by an initial use of lighter rail and stock which proved a not insubstantial addition to the charge on capital in the new century.³³

It could be argued that the issue of sectoral winners and losers is also one of timing. The most important issue affecting the development of the three sectors was the establishment of the trunk-line principle for railways, which traces its origin to the 1870 public works programme that began comprehensive and coordinated central government administration of transport in New Zealand.³⁴ Commentators have concentrated on the benefits of railway construction to producers, namely the (rural) exporting sectors, and the producers for the domestic market who were key users of the network, but the national character of the trunk system also benefited consumers through the reduction of local monopolies.³⁵ Given that the alternative to longer-distance passenger transport before the First World War was coastal shipping, the extension of the rail network can also be seen as providing a faster, more consistent, and more comfortable journey

31 The Main Highways Bill is one of the best examples of this. It is noteworthy for the agitation about the relative gains to urban and rural dwellers and their sectional subsets rather than a clear analysis of the implications for other land transport. See NZ, *Parliamentary debates*, 1922, vol. 198, pp. 495–509, but especially p. 502.

32 NZ, *Appendix*, 1929, B-6, p. 16; Easton, 'GDP deflator', p. 100. The seven lines in question ranged in cost per mile from £29,000 to £54,000. Neale, 'Railway situation', pp. 77–9.

33 See Dowie, 'Business politicians', for a discussion of this and of other determinants of nineteenth-century line siting.

34 Dowie, 'Business politicians', pp. 48–55, has suggested that the trunk-line principle was in part a compromise related to the political power of provincial government that functioned to integrate and expand existing communities rather than to promote new settlement. See Hawke, *Making of New Zealand*, p. 81, for a qualification of this view.

35 See Dowie, 'Business politicians', pp. 49–51; Sutch, *Poverty*, pp. 98–9; and Sutch, *Colony*, pp. 10–11.

for passengers. Until the interwar period revenue from railway passenger services subsidized losses on goods services and the reduction in passenger receipts with the arrival of motor transport after the First World War was more dramatic than for freight receipts. The number of rail passengers, excluding season-ticket holders, fell in the 1920s by about one-half despite Railways Department efforts to promote convenient and more comfortable travel, and passenger revenue fell from 112 per cent of the average costs per train mile (inclusive of interest) in 1914 to be 66 per cent by 1930, compared with 85 to 90 per cent of costs for goods traffic over the same period.³⁶

The benefits from the reduction in freight charges in all sectors as a result of interwar roading improvements were widespread, and a rapid increase in the number of private transport operators is apparent from the nationwide registration of motor vehicles that began in 1925.³⁷ The faster growth in the number of vehicles was evident in relation to trucks, which doubled in number and probably quadrupled in ton-mileage from 1925 to 1929. It is not possible to distinguish between private and business motor cars, nor is it possible to exactly gauge the difference in numbers of rural and urban vehicles, but over the same period cars increased by 75 per cent. Car density was similar in both islands and within population districts with the exception of the two largest urban areas, implying that initially the greatest car density was to be found in districts with a population greater than 40,000 but less than 100,000 people (9 people per car) rather than in districts with a population of between 10,000 and 40,000 (13 people per car) or over 100,000 people (14 people per car).³⁸ Between 1930 and 1950 truck numbers increased by around 240 per cent compared with 56 per cent for cars, but from this time a much more rapid expansion was seen in car numbers which increased by 275 per cent between 1950 and 1970 compared with a growth rate of 115 per cent for truck numbers in the same period.³⁹

³⁶ NZ, *Appendix*, 1930, H-40, p. 88; Valentine, 'Railway transport', pp. 75–8. Passenger revenue also includes mail.

³⁷ The increased competition from road operators saw the Railways Department turn its attention towards the securing of long-distance trade, and dramatic price reductions on many routes for certain classes of goods provoked a price war with shipping operators in the 1920s.

³⁸ Statistics are given by highway district, and a better density proxy is the allocation of the fuel tax, for urban and town centres. Apart from the two largest centres (Wellington and Auckland) all centres were similar to the average for each island. NZ, *Appendix*, 1930, H-40, pp. 27, 77; NZ, *Statistics*, 1926, vol. 1, pp. 4–5; NZ, *Statistics*, 1936. Bus registrations had showed similar increases to cars until the passing of an Act in 1926 that restricted the operations of private firms competing with public services.

³⁹ NZ, *Appendix*, 1930, H-40, pp. 26–8; NZ, *Appendix*, 1950, H-40, pp. 36–7; NZ, *Appendix*, 1970, H-37, p. 79. The pace of truck registrations did not slow significantly from 1932 with the passing of the *Transport Licensing Act* that

Footnote continued on next page . . .

V Policy changes in relation to transport infrastructure from 1925

The slowing in the expansion of the frontier of production in the 1920s coincided with changes in policy toward the various transport networks. Expansion was still an important element within the roading sector although, as noted above, at a reduced rate. The focus of road infrastructure from the interwar period onwards was increasingly on improving the existing network to accommodate the demands of motor transport. The expansion of rail mileage also continued during the interwar period at a pace which reflected differing perspectives on the role of the railway and of public works in general, but this period also marks the beginning of contraction in certain parts of the network, a process which accelerated from 1950.⁴⁰ The rationalization of harbour board assets continued during the interwar period so that by 1950 the 'big six' controlled just under 80 per cent of total assets.⁴¹

A major factor behind these changes was the growing popularity of private motor transport. Being a relatively wealthy nation with a low population density, motor transport was quickly adopted in New Zealand and the real annual bill for motor vehicles and equipment increased more than fourfold between 1914 and 1929. There were on average a little over 11 persons per car by 1929 but the extent of road formation that had occurred, mostly prior to 1914, implied a low traffic density of 2.6 cars per mile of formed road. New Zealand at this time had just under half the per capita car ownership of the United States, the country with the highest per capita consumption, but one-third of its number of cars per mile of formed road.⁴² Two policy initiatives that supported the move away from public to private ownership of land transport had implications for the sectoral distribution of transport capital formation.

The second of these initiatives (chronologically) was the separation of the Railways Department working accounts from the general accounts of the central government in 1925. The increased accountability associated with this move provided the framework for an emphasis on the consolidation of business that tempered network expansion. At the same time extra incentives for profitability were created as surpluses on the

extended the restrictions on private passenger services to freight services. See Williams, 'Co-ordination'.

⁴⁰ Over the interwar period attitudes towards expansion as against consolidation to some extent reflected the ideological commitments of particular administrations. The Reform government under J.G. Coates (1925–28) recommenced the programme of improvements started in 1914; the United government (1928–31) placed more emphasis on the completion of the main trunk; and the Labour government (1935–49) expanded construction over the whole network as part of an overall package of public works expansion. The maximum mileage of open line of 3,528 miles was reached in 1949, coinciding with the final year of office of the Labour administration.

⁴¹ A further six boards had been constituted since 1925. NZ, *Local authorities handbook*, 1950, p. 184.

⁴² NZ, *Appendix*, 1930, pp. 61–3.

operations of the department were no longer subsumed under the general government current account. The increase in competition from motor transport operators was met by improvements to the existing rail network supported by legislation restricting the operations of private transport operators.⁴³ An £8 million programme of improvements representing around 20 per cent of capital on open lines was commenced in 1925, following on from an uncompleted programme of improvements legislated for in 1914.⁴⁴ At the same time 15 per cent of the railways construction vote was to be diverted to improvements to terminal facilities, to line improvement and duplication, and to the modernization of rolling stock. Much of these improvements were necessitated by the previously existing separation of railways construction and operation, as savings in construction costs for the Public Works Department manifested themselves as greater working costs and increasing improvement outlays for the Railways Department. Thus 54 per cent of the planned improvements in 1924 were for works such as grade easements, rearrangements, deviations, and strengthening works, and 27 per cent of the total work carried out under the 1914 Act was of a similar nature. Furthermore, the replacement of light track with heavier track continued to be an important component of maintenance expenditure. One of the outcomes of the separation of railways operations was greater input into the construction process, although the siting of new lines remained subject to parliamentary authorization.

Another outcome of the separation of accounts was to make more explicit the position of the Railways Department. In general terms this meant the abolition of the policy rate of interest constraint and a better detailing of departmental revenue and expenditure flows. More particularly it separated out the subsidization of the department from the general government current account for operations on 'developmental lines' and highlighted one of the costs to railway profitability of the developmental policy of construction.⁴⁵ This helped to intensify a hardening of attitude to branch lines, which were equated with developmental lines. As early as 1922 one of the key architects of the Main Highways Boards was speculating that extension of transport networks would be better satisfied by the construction of roads rather than by the expansion of the branch-line system, this two years before he

⁴³ See footnotes 38 and 39 above.

⁴⁴ The 1914 Act envisaged a £3.2 million programme of improvements of which only £1 million had been undertaken by 1924. NZ, *Appendix*, 1924, D-2A, p. 2.

⁴⁵ This subsidization finished in 1929, pre-dating a write-down of capital the following year which represented 13 per cent of total line construction cost and left the department worse off by just over £500,000 in that year. NZ, *Appendix*, 1930, D-2, p. vi. The department would no doubt have been unimpressed by the *quid pro quo* as the capital write-down represented capital funded out of consolidated fund reserves and was seen as subsidization of developmental lines by productive lines. On the positive side, this action could be seen as the next step towards line closures.

had added the Railways Department to a portfolio which included Public Works.⁴⁶ Open rail mileage increased by only 6 per cent from 1926 to the start of the Second World War compared with an average increase of 15 per cent from 1900 to 1925.

The other policy initiative was the establishment of the Main Highways Board in 1922 to ensure greater central government finance and to control trunk routes subject to deficient funding or heavy (especially arterial) use. The *quid pro quo* for more finance for roading was central government control over arterial routes and coordinated regional administration of the non-arterial routes through a comprehensive system of road classification, in order to concentrate and reduce maintenance expenditure.⁴⁷ Work on main roads continued to be undertaken by local authorities in many areas although subject to board specifications and standards.

The resumption of central government control over arterial routes did not increase the extent of central government debt on account of roading which by the interwar period was light compared to the total road infrastructure debt. A 1930 Transport Department estimate of land transport facilities suggested a public indebtedness on account of roading of around 60 per cent of the capital estimated to have been expended on it, and half of this was on the central government account.⁴⁸ The lack of railway capital redemption on the other hand implied little change to its capital charge burden except via (upward) revisions to the policy profit rate prior to 1925. Removal of the policy rate constraint in this year coincided with an inability to raise most tariffs because of the increased competition from motor transport operators. By the mid-1920s, with the inability of the department to return full interest on capital, it became more widely accepted that extensions to land transport facilities could in many cases be better undertaken via roading. Despite this, further rail-line expansion could still be supported in parliament on the basis of its developmental benefits.⁴⁹

A critical element in the financing of road infrastructure from the 1920s was the imposition of user taxation, which was quickly able to generate a surplus over current expenditure. A year after the imposition of a fuel tax, 26 per cent of the total annual expenditure on roading represented sinking

⁴⁶ NZ, *Parliamentary debates*, 1922, vol. 198, p. 484. Both Prime Minister W.F. Massey (1912–25) and his successor J.G. Coates indicated their support for increased roading expenditure over rail because of greater benefits expected for primary producers. Ministry of Public Works Archives, W1 62/24, part 1, memo dated 10/8/1923.

⁴⁷ For example, 'After all, if there is to be some method of control of highways, the time having arrived for it, it is better that whatever money is given in the future should be given on the clear understanding that it is going to be applied with certain objectives in view' (J.G. Coates). NZ, *Parliamentary debates*, 1922, vol. 198, p. 486.

⁴⁸ NZ, *Appendix*, 1930, H-40, pp. 21 and 49.

⁴⁹ NZ, *Appendix*, 1929, D-1, p. xix. Compare NZ, *Parliamentary debates*, 1929, vol. 223, p. 1191.

fund and interest payments.⁵⁰ One-third of all roading revenue now came from motor tax or duty on vehicles and parts, implying that 5 per cent of the total central government annual roading bill needed to be found from sources other than motor taxation. By 1936, of almost £6 million designated as expended out of the Main Highways capital account since its inception in 1924, 50 per cent was funded from a loan underwritten by the first user tax (on tyre imports) and 25 per cent represented transfers from the revenue fund.⁵¹ Separate revenue and construction accounts were abolished in that year, given the extent of capital funding out of current receipts, with 'cash balances (to) be utilised to better advantage'.⁵² In 1954 National Roads Boards were established to supercede the Main Highways Boards and by this time over one-quarter of the capital formation undertaken by the boards had been funded from the general government current account.⁵³

It is clear that the potential of motor tax was understood by the architects of the *Main Highways Act*. The tax was first levied on tyre imports and via drivers licences, with the tyre tax used as security for the first loan raised for the Main Highways Board (£3 million) and as an indication of the administrative success of such a tax:

The number of motor vehicles is constantly increasing, so far at a much faster rate than population. Therefore this factor, in common with the general wealth of the Dominion, will result in an ever-increasing amount of money being available

⁵⁰ NZ, *Appendix*, 1930, H-40, p. 50. No information was available before this. Despite more stringent requirements for local government sinking fund payments compared with central government and despite the fact that the outlays of the former represented around 75 per cent of total road outlays, by 1928 38 per cent of the annual central government bill on account of roads was sinking fund and interest compared with 20 per cent for local government. Sinking fund payments in this year of between 5.5 per cent and 6.5 per cent of total road debt are comparable to the annual loan charges of 6 per cent of total indebtedness for harbour boards but not to the 1.6 per cent for the Railways Department.

⁵¹ NZ, *Appendix*, 1929, B-2, p. 1; NZ, *Appendix*, 1930, H-40, p. 50; NZ, *Appendix*, 1936, D-1, Table 1; Ministry of Public Works Archives, W1 62/24, part 1.

⁵² NZ, *Parliamentary debates*, 1935, vol. 243, p. 638. The amalgamation was questioned by only one parliamentarian (J.G. Coates) who considered it 'a revolutionary change' but he was unable to elaborate: see NZ, *Parliamentary debates*, 1935, vol. 243, p. 644.

⁵³ Around 20 per cent of the £76 million of board revenue since inception was not expended on construction, improvement, and maintenance. 73 per cent of this was expended on local authority subsidies and loan charges in roughly equal proportions. NZ, *Appendix*, 1953, D-1, pp. 49–52. With the establishment of the National Roads Board fund in 1954, £14.5 million of extraordinary money was transferred to it out of the general government current account and a further £4 million was transferred for expenditure on developmental and backblock roads. By 1968, with the withdrawal of all motor taxation from the general government current account, the charge on this account for roading stood at 5 per cent of total National Roads Boards receipts, the proportion calculated to have been borne by the state in 1928. NZ, *Appendix*, 1968, D-5a, p. 59.

so that by the time the first loan is raised and expended the way will be clear for the raising of further loan moneys.⁵⁴

By 1930 motor vehicles represented 12 per cent of total imports, having steadily increased from less than 1 per cent of total imports in 1910. Motor taxation increased substantially with the imposition in 1927 of a 4 pence per gallon tax on motor spirits, the imports of which by this time had expanded over 7 times from their pre-war level.⁵⁵ Three years after its imposition the fuel tax represented over 30 per cent of all special motor taxes to that date. The tax rate was increased by 2 pence in each year between 1931 and 1933 and by a further 4 pence in 1939, the last three all clearly raised for general taxation and not disbursed for transport purposes.⁵⁶ Tax rises of this magnitude were masked by the fall in the price of fuel, which in 1928 stood at half the average price that had existed before the First World War and at 28 per cent of the peak fuel price of the 1920s. By 1932 the import price of petrol had dropped a further 40 per cent from its 1928 level.⁵⁷

VI Conclusion

Considerable public resources were devoted to the creation of transport infrastructure, with the pattern of expansion in each of the three transport sectors analysed being broadly similar until the interwar period. This largely reflected the contribution of each sector to the extension of the productive area of the New Zealand economy and by the First World War much of the expansion of transport networks had been completed. This provided a base for future developments in transport, and technological change mainly affecting inland transport ensured that further developments would be dominated by the need for infrastructural improvements whilst implying rationalization of water transport. Expanding capital formation in roading was greatly assisted by the provision of several channels of funding, of which user taxes would be critical. The rail network, on the other hand, faced a new era in which the advantages of its statutory monopoly were considerably undermined, with full charges on its capital commitments and with increasing accountability and public scrutiny of its performance. Fiscal outcomes pointing towards the decline of railways went with rather than against the direction of technological change in the interwar period, but despite this rail construction could still be promoted as necessary for developmental purposes up to and beyond the Second World War.

⁵⁴ Ministry of Public Works Archives, W1 62/24, part 1, memo dated 7/6/1922.

⁵⁵ NZ, *Appendix*, 1930, H-40, Table 16; NZ, *Yearbook*, 1903–1929.

⁵⁶ Other than that expended on road works as part of unemployment relief. NZ, *Appendix*, 1930, H-40, Table 16; NZ, *Yearbook*, 1946, p. 870; Valentine, 'Aspects', p. 69. The 1930 Department of Transport report suggested that the total motor tax on cars in New Zealand was 50 per cent greater than that in each of the six Australian states and about 40 per cent of that in Britain. The differential between New Zealand and Australia and Britain was either less or similar for trucks over 4 tons. NZ, *Appendix*, 1930, H-40, Table 28.

⁵⁷ NZ, *Appendix*, 1930, H-40, Table 16; and Valentine, 'Aspects', p. 69.

APPENDIX Table 1. Gross capital formation, for road, rail, and harbour infrastructure, New Zealand, 1846–1950 (£)

Year	Road	Rail	Harbour	Year	Road	Rail	Harbour
1846	428		48	1898	489,590	411,928	85,000
1847	20,078		2,231	1899	500,232	473,778	63,000
1848	21,731		2,415	1900	577,706	492,874	148,997
1849	13,980		1,553	1901	683,308	893,984	174,616
1850	3,321		369	1902	616,892	493,648	169,112
1851	10,854		1,206	1903	736,684	602,071	104,735
1852	14,546		6,455	1904	587,521	567,005	138,185
1853	33,255		5,000	1905	677,198	793,640	193,472
1854	68,070		40,000	1906	730,396	1,127,300	149,690
1855	42,600		5,000	1907	786,209	954,507	224,718
1856	48,084		10,000	1908	965,240	1,973,177	277,304
1857	73,265		5,000	1909	793,614	1,001,502	404,792
1858	79,261			1910	840,563	936,481	395,041
1859	82,235		15,000	1911	985,745	952,287	327,536
1860	65,953		35,000	1912	1,002,692	874,544	385,174
1861	99,039		20,000	1913	1,090,768	836,411	327,826
1862	143,069		12,902	1914	1,169,528	857,651	303,688
1863	208,255	50,300	36,233	1915	1,082,478	855,331	243,647
1864	331,870	73,300	38,095	1916	701,166	600,248	128,553
1865	140,735	143,300	25,190	1917	522,344	454,466	208,768
1866	162,209	73,300	20,757	1918	601,233	398,746	164,075
1867	127,929	155,812	25,503	1919	935,977	708,099	205,533
1868	120,020	98,342	12,642	1920	1,490,891	1,207,178	405,132
1869	85,787	84,053	9,371	1921	1,616,594	1,724,490	618,558
1870	81,504	212,493	16,351	1922	1,768,124	1,627,996	744,947
1871	116,700	484,260	10,500	1923	1,867,490	1,474,323	644,134
1872	165,700	838,787	17,500	1924	2,238,768	1,825,798	790,387
1873	256,600	1,348,071	42,000	1925	2,779,437	2,328,245	732,256
1874	388,760	1,423,390	57,500	1926	2,628,224	2,200,520	765,502
1875	328,450	1,081,141	80,500	1927	2,737,348	2,553,093	769,973
1876	147,902	673,750	126,500	1928	3,148,663	3,162,601	566,200
1877	369,156	564,887	128,000	1929	3,518,051	2,652,049	522,079
1878	555,388	754,127	163,000	1930	3,572,252	2,490,376	447,651
1879	539,088	668,367	136,000	1931	3,368,645	959,167	243,586
1880	528,466	960,336	143,000	1932	2,607,961	279,881	125,537
1881	389,430	445,246	163,000	1933	2,588,075	248,998	167,519
1882	426,322	427,332	136,000	1934	2,493,633	380,875	247,697
1883	450,302	648,805	169,000	1935	2,631,591	568,538	385,930
1884	421,030	649,802	171,000	1936	4,004,859	1,257,275	466,238
1885	427,066	717,681	141,000	1937	5,153,478	1,970,809	550,153
1886	404,966	960,524	197,000	1938	6,665,941	2,520,669	667,788
1887	357,826	534,665	210,000	1939	6,505,463	2,521,568	533,974
1888	249,888	266,635	142,000	1940	4,641,918	1,649,071	429,026
1889	254,770	283,780	106,000	1941	1,495,356	1,140,133	293,456
1890	224,286	176,420	117,000	1942	354,560	584,227	345,779
1891	254,258	151,328	106,000	1943	756,291	879,773	363,077
1892	273,010	216,476	96,000	1944	1,061,888	940,255	219,178
1893	336,550	172,778	92,000	1945	1,237,015	1,050,215	355,406
1894	268,186	242,594	72,000	1946	1,888,190	934,427	323,599
1895	257,880	949,963	84,000	1947	3,088,460	804,378	347,633
1896	276,398	227,875	66,000	1948	4,025,695	945,206	389,483
1897	497,894	255,588	64,000	1949	4,615,248	1,449,018	587,963

Source: See text.

APPENDIX Table 2. Price indexes, for road, rail, and harbour infrastructure, New Zealand, 1846–1950 (1926–30 = 1000)

Year	Road	Rail	Harbour	Year	Road	Rail	Harbour
1846	170		170	1898	461	452	486
1847	170		170	1899	474	490	503
1848	170		170	1900	476	519	488
1849	170		170	1901	428	456	476
1850	170		170	1902	489	494	496
1851	170		170	1903	498	498	500
1852	186		186	1904	541	486	519
1853	199		199	1905	498	502	493
1854	214		214	1906	517	532	503
1855	227		227	1907	543	562	533
1856	242		242	1908	561	549	540
1857	255		255	1909	537	545	524
1858	271		271	1910	574	570	542
1859	284		284	1911	580	576	553
1860	299		299	1912	587	585	566
1861	312		312	1913	598	597	593
1862	327		586	1914	637	636	627
1863	340	340	593	1915	652	654	669
1864	354	354	563	1916	679	686	742
1865	367	367	578	1917	739	753	862
1866	380	380	612	1918	798	821	995
1867	391	391	614	1919	850	865	981
1868	404	404	610	1920	971	991	1149
1869	417	417	612	1921	1062	1076	1182
1870	430	430	584	1922	1014	1021	1075
1871	443	456	615	1923	971	978	1031
1872	487	574	611	1924	979	985	1031
1873	511	638	652	1925	983	989	1029
1874	469	545	628	1926	998	1000	1018
1875	487	494	620	1927	1000	1000	1001
1876	502	507	587	1928	997	997	988
1877	480	477	613	1929	997	997	985
1878	513	494	589	1930	1000	1001	991
1879	515	486	561	1931	950	950	951
1880	485	494	597	1932	909	909	914
1881	498	481	567	1933	901	897	931
1882	517	498	565	1934	902	897	932
1883	500	477	539	1935	913	908	940
1884	493	469	549	1936	964	960	982
1885	465	443	524	1937	1064	1054	1098
1886	443	422	506	1938	1127	1117	1154
1887	439	439	491	1939	1129	1119	1152
1888	432	405	505	1940	1224	1208	1187
1889	445	426	542	1941	1270	1287	1219
1890	452	460	536	1942	1322	1346	1275
1891	450	431	521	1943	1343	1405	1325
1892	443	426	484	1944	1356	1389	1339
1893	443	426	458	1945	1424	1508	1405
1894	450	418	468	1946	1423	1522	1419
1895	408	401	431	1947	1484	1545	1409
1896	434	414	445	1948	1574	1643	1544
1897	450	426	470	1949	1629	1711	1642

Source: See text.

APPENDIX Table 3. Real gross capital stocks, for road, rail, and harbour infrastructure, New Zealand, 1846–1950 (£, 1926–30 prices)

Year	Road	Rail	Harbour	Year	Road	Rail	Harbour
1846	2,511		279	1898	26,092,549	34,638,553	6,803,683
1847	120,454		13,384	1899	27,117,843	35,333,785	6,928,950
1848	248,109		27,568	1900	28,297,732	36,008,264	7,234,376
1849	330,229		36,692	1901	29,849,632	37,667,328	7,601,250
1850	349,737		38,860	1902	31,070,430	38,376,535	7,941,980
1851	413,495		45,944	1903	32,504,963	39,250,379	8,151,308
1852	491,905		80,737	1904	33,547,491	40,084,353	8,417,398
1853	658,903		105,912	1905	34,859,179	41,316,674	8,809,629
1854	975,387		292,928	1906	36,215,507	43,038,992	9,107,132
1855	1,161,414		314,956	1907	37,604,200	44,364,839	9,528,150
1856	1,357,415		356,234	1908	39,269,590	47,603,193	10,041,067
1857	1,639,547		375,815	1909	40,692,945	49,209,525	10,811,729
1858	1,926,145		375,815	1910	42,094,709	50,527,668	11,539,292
1859	2,208,183		428,683	1911	43,733,940	51,879,368	12,130,496
1860	2,421,407		545,738	1912	45,355,859	53,095,515	12,808,639
1861	2,725,757		609,821	1913	47,097,057	54,241,190	13,358,362
1862	3,140,922		631,848	1914	48,850,580	55,335,817	13,832,698
1863	3,722,005	147,736	692,988	1915	50,421,790	56,440,828	14,186,355
1864	4,613,709	355,052	760,603	1916	51,354,915	57,168,679	14,347,669
1865	4,978,344	745,876	804,203	1917	51,965,152	57,684,915	14,577,217
1866	5,384,126	938,894	838,115	1918	52,623,959	58,113,674	14,729,525
1867	5,695,215	1,337,728	879,643	1919	53,624,619	58,831,703	14,924,657
1868	5,977,605	1,581,291	900,363	1920	55,062,310	59,909,300	15,259,185
1869	6,173,109	1,782,925	915,668	1921	56,499,091	61,313,250	15,762,095
1870	6,353,194	2,277,147	943,689	1922	58,158,199	62,669,920	16,433,412
1871	6,608,775	3,339,121	960,760	1923	59,979,176	63,867,326	17,032,571
1872	6,939,236	4,799,857	989,381	1924	62,079,171	65,531,644	17,769,823
1873	7,425,777	6,914,293	1,053,756	1925	64,688,643	67,373,654	18,449,906
1874	8,215,668	9,527,617	1,145,331	1926	67,048,995	69,075,714	19,168,513
1875	8,857,155	11,716,161	1,275,257	1927	69,574,482	71,095,899	19,902,293
1876	9,127,529	13,045,931	1,490,649	1928	72,508,580	73,752,484	20,438,617
1877	9,861,251	14,229,904	1,699,511	1929	75,755,646	75,884,727	20,930,896
1878	10,896,302	15,756,478	1,976,180	1930	79,075,987	77,807,088	21,343,633
1879	11,898,621	17,132,977	2,218,466	1931	82,348,312	78,292,907	21,560,015
1880	12,951,419	19,076,978	2,458,066	1932	84,970,955	78,078,611	21,656,443
1881	13,705,483	20,002,005	2,745,388	1933	87,623,493	77,811,278	21,792,772
1882	14,505,230	20,859,718	2,986,221	1934	90,033,580	77,681,947	22,011,057
1883	15,377,593	22,219,580	3,299,591	1935	92,566,620	77,761,572	22,368,795
1884	16,199,972	23,464,076	3,611,335	1936	96,439,958	78,502,604	22,781,771
1885	17,087,275	24,968,800	3,880,498	1937	100,969,801	79,817,265	23,213,440
1886	17,971,272	27,138,947	4,270,085	1938	106,521,090	81,533,666	23,712,062
1887	18,759,703	28,278,484	4,697,590	1939	111,879,980	83,227,899	24,087,391
1888	19,314,636	28,840,083	4,978,847	1940	115,366,255	84,033,009	24,350,645
1889	19,863,864	29,401,648	5,174,424	1941	116,295,554	84,317,395	24,483,469
1890	20,339,616	29,695,156	5,392,647	1942	116,332,374	84,112,684	24,639,169
1891	20,882,193	29,946,475	5,595,968	1943	116,680,243	84,020,785	24,790,606
1892	21,474,002	30,321,037	5,794,276	1944	117,199,890	83,936,156	24,823,620
1893	22,205,359	30,596,393	5,995,308	1945	117,742,193	83,845,755	24,936,187
1894	22,774,014	31,025,563	6,149,273	1946	118,710,869	83,684,358	25,009,888
1895	23,377,006	33,209,511	6,344,251	1947	119,048,272	83,422,847	25,086,870
1896	23,983,422	33,577,096	6,492,617	1948	121,140,601	83,155,229	25,158,283
1897	25,058,793	33,950,425	6,628,667	1949	123,350,191	83,187,350	25,329,272

Source: See text.

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