CHAPTER SEVEN

Partial Productivity Indicators (PPIs) of NSW Rail Passenger Services

7.1 INTRODUCTION

The purpose of this Chapter is to set up the hypotheses for testing in Chapter 8. But before the results of the PPI analysis are examined, some prefatory comments need to be made about the scientific method which is subsumed in this Chapter.

In the first instance, the analysis in the preceding Chapters has enabled the construction of a theoretical model of total factor productivity, based on NSW rail passenger services. In the general tradition of modern economics, an inductive reasoning process brings that analysis to the point where some hypotheses may be stated (Cohen and Nagel 1957). These hypotheses have two important properties which need to be understood at the beginning.

1. They are "hypotheses" in the sense that they are "...suppositions put forth to account for known facts and from which to draw conclusions that will result in the proposition being proved or disproved" (Hensher 1994). However, the facts reveal situations where the expected or normal conditions of economic "rationality" do not apply, i.e. where managers of the firm do not observe the economic rationalities found in the management of normal firms, which are operating profitably in competitive markets as defined in the economic sense. However, the economic meaning of "rationality" or its absence, is obscure, and subject to much contention. Thus, a search for a term which lends itself to a greater precision of definition in economics was made. It was found in the term "failure". Borrowed from organisation management theory and computer science, the basic thrust of the term is readily understood by the lay reader. It is etymologically descended from Latin and has lingual cousins in the major European languages. It closely describes the absence of necessary and sufficient conditions (for firms, markets, political institutions, etc.) and is, therefore, easily identifiable as a null hypothesis. Finally, it is a difficult term to misinterpret, if the reader has a good working knowledge of the English language. Thus, the term "failure" seems to provide a logical bed-rock for building suppositions which may be understood as hypotheses.
2. Having been derived inductively from the theoretical constructs of the previous Chapters, they occupy a special place in the study. It is suggested that they be seen as *overarching hypotheses* which attempt to explain the operation of the firm as a whole. That is, the propositions to be proved or disproved relate to the system as a

whole and the analyst is asked to view the facts at a macroscopic level. This is analogous to the natural scientist's method of viewing an organism as a whole, before analysing it in its parts.

Up to this point the scientific method may be regarded as relatively non-controversial, since the inductive logic of modern economics is applied. The next steps, however, involve reasoning deductively from facts revealed by PPIs established for each sub-system of rail passenger services for each market segment served and for each factor of production, used by each sub-system (labour, fuel, capital and materials). There are two problems with this approach.

1. The use of the *deductive method* which draws out the implications of what is revealed by the PPIs (Hensher 1994). Deductive method is not concerned with the truth or falsity of its premises, whilst the characteristic nature of induction is to be concerned with just that (Cohen and Nagel 1957). But induction, particularly in economics, takes us only as far as probable truth or falsity. Furthermore, deductive inference is often necessary for the ultimate establishment of inference that is based on the probable. As Cohen and Nagel (1957) show, "The order of nature, and the order of logical dependence, are not the same as the order of our discoveries".
2. The sheer volume of observations about a diversity of phenomena, revealed by the PPIs, makes the creation of hypotheses and their testing a very unwieldy process. The scientific method of economic research, and the facts themselves, fortunately suggest a practical alternative. The method of economic research indicates that *empirical propositions* can be established in the first instance by the observation of the PPIs (Hensher 1994). And since we are dealing with the inputs and outputs of the total system disaggregated to a sub-system level, there is a considerable degree of inter-connection between the conclusions derived from the analysis of each of the sub-systems. As a consequence, the conclusions from the empirical propositions may be grouped, in hierarchical form, as a relatively manageable number of deductively derived hypotheses.

7.2 THE OVERARCHING HYPOTHESES

The overarching hypotheses derived from the analyses in Chapters 2 to 6 may now be stated formally.

The term "failure" is used to denote a hypothesis which describes the absence of necessary and sufficient conditions for the efficient and effective operation of firms and markets.

7.2.1 Types of Failure

There are a number of types of failure which are identified in this study, and as was stated in Chapter 1, every one is characterised by poor information.

Market failure

In the context of this study, a market is said to be failed when it prevents the optimum allocation of economic resources. In the context of this study market failure is deemed to exist because we are dealing with a public sector firm which did enjoy a monopoly during a significant part of the study period but which markets are now being competed away by other modes of transport.

Institutional failure

This refers to failures by the Government and its institutions to remedy failures in the public sector firms for which they are accountable. These failures may be ones of omission or commission and may relate to markets, management or technology.

Technological failure

This may take two forms. First, when a major new technology fails to perform the tasks it is specified to carry out. Second, when a major new technology is part of an innovation process in the firm, and that process fails, because of failures elsewhere in the firm, or its markets.

Management failure

In its broadest sense this refers to the consistency of "accident proneness" of a firm's management, over the medium to long term. In normal market conditions, where market failure does not exist, the market corrects the situation by causing the firm to fail or causing a new management to be created to correct the situation. Where other failures exist, such as in long term government monopolies, management failure may persist for a long time, without correction.

Other failures

There are many other failures which are derivative of the above. Some of these are identified in Chapters 5 and 6, including: industrial relations, information systems, organisational, and government Budgets.

7.2.2 The Management of Failure

Overarching Hypothesis I

1. Where a firm operates in the context of one or more types of failure, in the long run, then that firm's managers may be deemed to be failure managers.
2. Failure management is defined as: continuous strategic decisions and actions by decision makers in government, industry, the firm or the unions to ameliorate the adverse consequences of one or more failures identified above. This is characterised by continuous interventions by managements, unions and governments, each of which has its own mental model of what might be happening in the market, the firm, etc., based on poor and incomplete information. This is because one of the characteristics of failure management is that it operates on failed information systems.
3. Failure management will continue until the originating failures are corrected. Thus, failure management can be long term, and can operate within a paradigm or culture built around the tacit or explicit assumptions of failure. Whilst they would not be termed as such, they may be dressed up in the rhetoric of, for example, fuzzy social welfare statements.
4. There are as many models of failure management as there are industries and business cultures. We have alluded already to two, namely the remnants of the USSR economy and decrepit Australian firms hiding behind remaining high tariff barriers, or other Government protection.

In Chapter 6, a number of models of failure management within the NSW rail passenger services paradigm were identified. These may be summarised, as follows:

- *The Post War Model:* characterised by severe labour and materials shortages, technological breakdowns and the inability of a monopoly service to meet demand.
- *The Winsor Model*: characterised by a turn-round from the deep crises of the previous Model, increased demand but at a significantly increased cost, and considerable instability in the Government's management of the Transport portfolio.
- *The McCusker Model*: characterised by its longevity and relative effectiveness, but ultimately ending in failure because it was selling passenger services in a failed market, at the same time as it attempted to buy its main resource—skilled and semi-skilled labour—in a highly competitive seller's market.
- *The Public Transport Commission Model*: characterised by failures of every kind, and all in major proportions. In a normal business situation, the Commission would have been a fit case for liquidation by the late 1970s. It survived because of the fuzzy logic imposed by social welfare criteria.
- *The Hill Model*: again characterised by a turnaround from the deep crises of the previous Model, the settlement (by "exhaustion") of the industrial situation, increased innovation and capital spending but at a heavy capital cost, and an acceptance of market failure which put the NSW Railways again in a situation of technical bankruptcy.

- *The Sayers Model:* characterised by organisational restructuring and a rapid shedding of labour in an attempt to reduce costs. Despite this, deficits have reduced only slowly because of a continued basic acceptance of market failure.

Overarching Hypothesis I can now be written thus: In the context of failure management, the employment of a firm's resources will never reach optimal efficiency until the initiating failures have been removed.

It has been argued that this hypothesis is almost a definition of the failure management model. Within the stricter definitions of an economic model where all the characteristics of economic phenomenon need to be identified (Collins 1993), only some characteristics are identified. For example, post 1992 models are also readily available and different from those identified from 1951/52 to 1991/92.

Overarching Hypothesis II

The second overarching hypothesis deals with the process of innovation in a failure management culture. As noted in Chapter 5, innovation may be defined as the process which creates a new production function within a firm which leads to a net improvement in the TFP of that firm. The innovation might be of a kind leading to the creation of a new firm, or a redefinition (or "re-engineering") of the old firm. But the innovation may also be at the margin of the existing business. This is sufficient to be regarded as an innovation if it creates a new production function leading to a net improvement in TFP.

Overarching Hypothesis II may be written thus: Chapter 5 clearly demonstrated that if an innovation is attempted in the context of a failure management regime, then it too will fail, in the long run, to achieve its full potential of improving the TFP of the firm.

Overarching Hypothesis III and IV

It was noted above that market failure is one of the originating failures which give rise to failure management. In Chapter 4, it was shown that fares setting and revenue generation of NSW rail passenger services was a function of the political process, where normal market conditions did not apply. This conclusion was reinforced in Chapters 5 and 6. This leads to two further Overarching Hypotheses:

Overarching Hypothesis III: Market failure existed in the market for NSW passenger services from 1951/52 to 1991/92, and no functional relationship exists between the output of passenger train services and average revenue per passenger. This is because average revenue is determined by the political process.

Overarching Hypothesis IV: Market failure was reinforced by the absence of any functional relationship between the output of passenger train services and revenue earned from "unremunerative" passenger journeys. This revenue is more clearly understood as an economic rent payable to passenger railways in NSW, to operate services at a politically acceptable level. In the study period, the evidence indicates that this rent has been highly negotiable.

7.3 PPIs AS A BASIS FOR EMPIRICAL PROPOSITIONS

PPIs are essentially descriptive and non-parametric tools of analysis. They have a value in that they provide the lay reader with an intuitive appreciation of the data presented in PPIs and insights on productivity performance. In the context of this thesis, PPIs measure the physical productivity (output per unit of physical input) of NSW rail passenger services or of the utilisation of physical assets and the non-capital inputs of labour, fuel and materials. They are partial productivity measures because the productivity of one input is measured at a time, with the other factors in place.

As has been pointed out in other studies (Hensher et al. 1992), PPIs have limitations as analytical tools, as follows:

1. Even when jointly considered with other PPIs, they give only a partial view of productivity.
2. PPIs fail to recognise the role of each input in the determination of total cost. This is particularly important when the impacts of one particular input on total cost vary over time.
3. PPIs also do not recognise that individual inputs are not homogeneous. For example, the elimination of on-train crew can have a greater impact on costs than the elimination of station staff.

The remainder of this Chapter is organised as follows: Figure 7.1 schematically outlines the four NSW passenger services sub-systems and the PPIs which are used to describe the productivity of each sub-system. On the *horizontal* axis of each sub-system table are the four market segments, each of which is described by three output indicators: passenger journeys, passenger kilometres, and seat kilometres. On the *vertical* axis of each sub-system table are the four input factors: labour, fuel, materials and capital. For the purposes of Chapter 7, the input factors are not further sub-divided. However the data is available in RAILDATA (Appendix 2). The reason for this approach is that the PPIs derived from these data are used to build strategic hypotheses on factor productivity, so that a test may be made of the hypotheses in the following Chapter.

Each cell in Figure 7.1 refers to a Figure (or Table in the case of capital) which depicts a PPI. Each PPI is discussed in turn, with all Figures and Tables presented at the end of the Chapter. At the conclusion of the commentary on trends and other information revealed by each PPI, an empirical proposition is then established. These propositions are then grouped, in hierarchical form, as hypotheses.

Figure 7.1 Schematic outline of NSW passenger services subsystems and the PPIs describing performance (numbers refer to Figures in Ch 7)

Train running sub-system

Inputs	Suburban			Interurban			Country			Interstate		
	PJ	PKm	SKm	PJ	PKm	SKm	PJ	PKm	SKm	PJ	PKm	SKm
Labour	7.2	7.3	7.4	7.2	7.3	7.4	7.2	7.3	7.4	7.2	7.3	7.4
Fuel	7.5	7.6	7.7	7.5	7.6	7.7	7.5	7.6	7.7	7.5	7.6	7.7
Material	7.8	7.9	7.10	7.8	7.9	7.10	7.8	7.9	7.10	7.8	7.9	7.10
Capital	T7.1	*	*	T7.1	*	*	T7.1	*	*	T7.1	*	*

Corridor sub-system

Inputs	Suburban			Interurban			Country			Interstate		
	PJ	PKm	SKm	PJ	PKm	SKm	PJ	PKm	SKm	PJ	PKm	SKm
Lab. VTM	7.17	7.18	7.4	7.17	7.18	7.4	7.17	7.18	7.4	7.17	7.18	7.4
Lab. Fixed	7.20	7.21	7.7	7.20	7.21	7.7	7.20	7.21	7.7	7.20	7.21	7.7
Mat. VTM	7.23	*	*	7.23	*	*	7.23	*	*	7.23	*	*
Mat. Fixed	7.24	*	*	7.24	*	*	7.24	*	*	7.24	*	*
Capital	T7.3	*	*	T7.3	*	*	T7.3	*	*	T7.3	*	*

Terminals (stations) sub-system

Inputs	Suburban			Interurban			Country			Interstate		
	PJ	PKm	SKm	PJ	PKm	SKm	PJ	PKm	SKm	PJ	PKm	SKm
Labour	7.11	7.12	7.13	7.11	7.12	7.13	7.11	7.12	7.13	7.11	7.12	7.13
Fuel	-	-	-	-	-	-	-	-	-	-	-	-
Material	7.14	7.15	7.16	7.14	7.15	7.16	7.14	7.15	7.16	7.14	7.15	7.16
Capital	T7.2	*	*	T7.2	*	*	T7.2	*	*	T7.2	*	*

Business and corporate administration sub-system

Inputs	Suburban			Interurban			Country			Interstate		
	PJ	PKm	SKm	PJ	PKm	SKm	PJ	PKm	SKm	PJ	PKm	SKm
Labour	7.25	7.26	7.27	7.25	7.26	7.27	7.25	7.26	7.27	7.25	7.26	7.27
Fuel	-	-	-	-	-	-	-	-	-	-	-	-
Material	7.28	7.29	7.30	7.28	7.29	7.30	7.28	7.29	7.30	7.28	7.29	7.30
Capital	T7.4	*	*	T7.4	*	*	T7.4	*	*	T7.4	*	*

Notes

PJ = thousand passenger journeys per unit of input, or cost per pass. journey in the case of capital.
PKm = thousand passenger kilometres per unit of input.
SKm = thousand seat kilometres per unit of input.
VTM = Variable Track Maintenance.
* means not indexed.

7.4 TRAIN RUNNING SUB-SYSTEM PPIs

7.4.1 Train Running Labour

Thousand passenger journeys per train running labour

Figure 7.2 shows index numbers of train running labour per thousand passenger journeys, where the base year, 1951/52 = 100, except in the case of Interurban, where the base year is 1958/59. The graphs show that each market segment is partially cyclical where recessions have tended to significantly reduce patronage, without reducing the labour component, which is not laid off during economic downturns. Suburban, Country and Interstate market segments have all shown long-term growth in thousand journeys per head of labour, but not as much as the Interurban market segment which shows almost a fourfold increase in its PPI index, since 1958/59. The acceleration in growth, however, did not commence until 1974/75. This coincided with the election of the Wran Government, and the implementation of a deliberate policy of development of cheap land on the periphery of Sydney, coupled with a policy of cheap public transport which was of good technical standard. This created a substantial new commuter market, with Interurban patronage increasing from 2 million in 1973/74 to over 13 million in 1991/92. The conclusion to be drawn from this is that in a firm with rigidities in labour supply (especially train running labour) a necessary requirement for significant improvement in labour productivity is a strongly growing market.

Empirical Proposition 1
A strong and sustained growth in demand for a rail passenger service is a necessary requirement for a strong and sustained improvement in train running labour productivity.

Thousand passenger kilometres per train running labour

Figure 7.3 shows index numbers of train running labour per thousand passenger kilometres, where 1951/52 = 100, except Interurban, where the base year is 1958/59. Again the cyclical nature of the demand indicator is evident.

The growth in the index numbers for Suburban and Interurban follow the pattern for passenger journeys, i.e. index number increases are due to patronage growth. But this is not the case for Country index numbers, where a major structural change in supply in the 1990s radically changed labour productivity after 1989/90, as follows:

1. The elimination of branch line train services, their replacement by road coach services and a concentration upon line haul services, sustained the long haul

elements of country passenger journeys while eliminating short distance branch line journeys.

2. The elimination of branch line rail services resulted in a sharp drop in train running labour. Some structural changes to timetables, train sizes etc. were also undertaken with Interstate services, resulting in a labour productivity performance as good as Interurban services, but not as high as Country services.

This result suggests the conclusion that where a market is stagnant or declining and labour market rigidities reduce the impacts of marginal reductions in service, then a radical re-structure of services, based on line-haul services only, is the only practical strategy for bringing a once-and-for-all improvement in labour productivity.

Empirical Proposition 2

Where demand is weak, the only option for bringing about an improvement in train running labour productivity is to radically restructure services, and concentrate upon the line haul element. But this is only a "one-off" solution, and is no guarantee against a continued weakening of demand.

Thousand seat kilometres per train running labour

Figure 7.4 shows index numbers of train running labour per thousand seat kilometres, where 1951/52 = 100, except Interurban, where the base year is 1958/59. Unlike the "demand side" indicators, of journeys and passenger kilometres, seat kilometres is a "supply side" indicator of output.

In the case of the Suburban market segment, it is immediately noticeable that the growth of seat kilometres per person of train running labour is double that of the demand side indicators, reflecting the substantial increase in capacity arising from the conversion from single decked to double decked trains. It was noted earlier in the thesis that while this increased capacity is able to cope well with the peak period demand, considerable excess capacity exists in the off-peak periods. Thus whilst the apparent productivity of train running labour per thousand seat kilometres has quadrupled, there is a disequilibrium with the growth in the demand side indicators (which only doubled). Interurban seat kilometres were also quadrupled, but this matches the demand side indicators.

The rapid growth in Country seat kilometres in the 1980s reflects the strategy to boost line haul capacity around the XPT train, and the elimination of branch line trains. However, the end result is an overall growth rate in seat kilometres only half that of the demand side indicators. This suggests a better utilisation of available capacity than Suburban services. A similar pattern exists with Interstate services. In these cases, the disequilibrium in productivity growth rates is the reverse of that in Suburban services. This is probably due to the re-structuring of services and a re-deployment of labour from branch line to line haul services.

The most important conclusion to be drawn from this set of PPI indicators is that which describes the Suburban market segment. Whilst the double-decked train strategy has resulted in a quadrupling of train running labour productivity, it has created a disequilibrium between supply and demand side productivity. This needs to be brought into equilibrium, because there are costs associated with excess capacity.

Empirical Proposition 3
Where a supply side business strategy has created significant excess capacity then it behoves management to create additional demand (to utilise this capacity) in order to achieve the potential train running labour productivity gains suggested by the growth in seat kilometre productivity i.e. there must be a doubling in demand side productivity.

7.4.2 Fuel Consumption

Fuel consumption (gigajoules) per passenger journey

Figure 7.5 shows index numbers of fuel consumption per passenger journey (gigajoules per journey), where 1951/52 = 100, except Interurban, where the base year is 1959/60. Unlike the labour PPIs, the higher the index numbers the worse the fuel productivity. This is because the divisor, in this case, is the passenger journey, and the dividend is fuel consumption.

In the case of the Suburban market segment, the index shows an approximate doubling, indicating a halving of the productive efficiency of fuel. This is consistent with the double decked train strategy, where increased fuel consumption in powering the larger capacity trains has not been matched by an increase in patronage.

In the case of the Interurban market segment, the index numbers fluctuate. The use of steam trains is reflected in the index numbers to about 1970, followed by the effect of a drop in patronage in the early 1970s. This in turn was followed by high fuel economy liquid fuel traction and increasing demand until the early 1980s, and the impact of double decked electric trains on Interurban services. The Country service PPI reflects a more complex set of factors. From 1952/53 until 1970/71, the index numbers are below 100, indicating good fuel efficiency. This was a period of relatively stable demand serviced by a mix of steam and diesel locomotives in a relatively optimum mix of traction with steam undertaking shorter haul branch line services and diesel the line haul services. A slump in patronage (including boundary changes to Interurban), from 1974/75 was coupled with a greater use of high-horsepower diesel locomotives (because of performance characteristics), and reduced fuel efficiency from the mid 1970s, onwards.

A similar set of circumstances influenced Interstate services' fuel efficiency, but here the deterioration is significantly greater mainly because of greater journey length, higher train speeds and relatively low patronage.

The conclusion suggested by the data is that higher performance characteristics of train power units, and greater use of energy to increase passenger comfort (such as air conditioning) reduces fuel efficiency.

Empirical Proposition 4
The downside in the quest for improved rollingstock performance is an increase in fuel consumption. The negative effects of this can be minimised by increased ridership.

Passenger kilometres per gigajoule of fuel

Figure 7.6 shows index numbers of passenger kilometres per gigajoule, where 1951/52 = 100, except Interurban, where the base year is 1959/60. The divisor in this figure and Figure 7.7 is the reverse of Figure 7.5. This was necessary because of the arithmetic of large numbers with passenger and seat kilometres. Although it reverses trends it still enables the establishment of valid empirical propositions.

In contrast to the last section, the index numbers decline by about half in the case of Suburban and Interurban. This is because the divisor here is the gigajoule, whereas previously it was the passenger journey. In the case of Interstate the decline is even sharper, to about one sixth. This again reflects the fact that Interstate passenger kilometres have remained about the same throughout the study period whereas fuel consumption has increased by a factor of six reflecting the impact of the use of higher performance diesel locomotives since the late 1970s. Whilst Country fuel consumption per kilometre has fluctuated up to over 200 index points, it settled at 129. This reflects a better mix of motive power between high-powered XPT diesels and lighter engined diesel trains on other services.

Empirical Proposition 5
Some closer attention to optimising fuel usage and ridership would improve fuel productivity, as is suggested by fuel used in Country services.

Seat kilometres per gigajoule of fuel

Figure 7.7 shows index numbers of seat kilometres per gigajoule, where 1951/52 = 100, except Interurban, where the base year is 1959/60.

As in the last section, the index numbers decline in the case of Interstate and Interurban, and for similar reasons. Unlike the last section, Suburban index numbers have remained more or less constant. This reflects the substantial growth in seat kilometres resulting from the replacement of single decked carriages with double decked carriages. Also, unlike the last section, Country index numbers have declined by half, suggesting a much poorer utilisation of seats, per unit of fuel used.

Empirical Proposition 6
Again, the general decline in seat kilometres per unit of fuel used suggests that greater attention needs to be paid to optimising fuel consumption and rollingstock used in passenger services.

7.4.3 Train Running Materials and Other Cost per Passenger Journey

Train running materials and other cost per passenger journey

Figure 7.8 shows index numbers of material cost per passenger journey (1989/90 cents per journey), where 1951/52 = 100, except Interurban where the base year is 1958/59. In all cases the index numbers decline substantially, with the decline being most pronounced in Suburban (85%) and Interurban (89%). This is a clear reflection of the modernisation of fleets, resulting in a decline in materials usage.

Empirical Proposition 7A
Fleet modernisation has had a clear and significant impact upon the productivity of materials and other costs.

Train running materials and other cost per passenger kilometre

Figure 7.9 shows index numbers of material cost per passenger kilometre (1989/90 cents per passenger kilometre), where 1951/52 = 100, except Interurban, where the base year is 1958/59. As previously, the index numbers show a marked decline, reinforcing the statement in Empirical Proposition 7.

Train running materials and other cost per seat kilometre

Figure 7.10 shows index numbers of material cost per seat kilometre (1989/90 cents per seat kilometre), where 1951/52 = 100, except Interurban, where the base year is 1959/60. As with costs per passenger journey and kilometre, the index numbers for Suburban and Interurban services show a marked decline, reinforcing the statement in Empirical Proposition 6. The decline was slower in Country and Interstate, and then increased from 1989/90. This reflects the decline in seat kilometres rather than any aberration in the statistics.

7.4.4 Train Running Capital Cost

Train running capital cost per passenger journey

Table 7.1 (at the end of the Chapter) illustrates the rise in capital cost relative to passenger journeys. A table is considered more appropriate than a figure in this instance.

In the case of Suburban passenger journeys, the cost index numbers rise to 940. In the case of Interurban, the rise is to 1330. In the case of Country the rise is 450, and in the case of Interstate the rise is 163. An analysis of cost rises in monetary terms is also instructive:

	Cost per passenger journey ($1989/90)	
Market segment	1951/52	1991/92
Suburban	0.04	0.37
Interurban	0.21	2.74
Country	4.24	19.04
Interstate	7.40	12.10

This is a crushing increase in the cost burden—an increase which would have sent a commercial enterprise into bankruptcy, and which contributed substantially to the technical bankruptcy of the NSW Railways, reported in earlier chapters.

Its causes are an amalgam of factors, also reported in earlier chapters, namely:

Suburban market segment

As we saw in Chapter 5, the double-decked suburban electric carriage was first introduced in 1963/64 to replace the single-decked red rattlers, which had been in service since the 1920s. However, this program was not completed until 1992/93. The double-decked train was at the forefront of technology in its early introduction. But, it also contained many technological problems, so that the train's design went through many configurations, which culminated in the Tangara, itself a state of the art design.

But all of these technical improvements failed the test of innovation, since all they did was to create significant excess capacity.

The long period of introduction of the double-decked suburban train and the technical issues which it created, focused too much management interest on the technology of running double-decked trains. Too many management and political reputations and egos thus became embroiled with the issues. As a consequence the unit costs of manufacturing the rollingstock rapidly escalated, exacerbated further by the relatively short and intermittent production runs.

The costly problems above were made worse in years when capital funds were not forthcoming from traditional sources and other more costly sources of capital, such as leasing, had to be found. In the regime of high interest rates of the 1980s, in particular, this was a major factor in increasing the cost of capital.

Interurban market segment
Similar factors to those operating in the Suburban market segment also operated in the case of the Interurban double-decked train, and again reported in Chapter 5. The Interurban position varies from the Suburban position in the following respects. Excess capacity in the off-peak periods is very much higher (over half the trains operating on weekdays have a maximum load factor of less than 40 per cent of train capacity) unit costs of production of rolling stock are higher due to the short production runs and the political imperatives pushing investment in interurban rollingstock have been very strong.

Country market segment
The increase in the capital cost per journey in this market is essentially the story of the introduction of the XPT train to country passenger services, also discussed in Chapter 5. In the end, it proved to be a costly failure to prevent the steady attrition of the country passenger market. That capital costs in 1991/92 represented $19 per passenger journey is a major testimony to this factor.

Interstate market segment
Capital cost per passenger journey increased from $7.40 in 1951/52 to $12.10 in 1991/92. Though high on a cost per journey basis, it does not display the increase evident in the other market segments. This was due to the nature and timing of investment in Interstate rollingstock. It was the beneficiary of investment decisions made in the 1950s and 1960s for the introduction of comfortable train services between Australia's capital cities. Whilst capital was not spared on the rollingstock, interest rates were low and unit costs of production were also competitive. No major investment was

undertaken in rollingstock since the mid 1970s. The general conclusion which these data lead to is that train running capital cost is almost entirely associated with investment in new rollingstock. In the case of NSW passenger services, this investment was technically inventive only. The rollingstock was largely introduced as a "one-for-one" replacement of very old and worn out equipment, with little regard for market needs. It thus failed a principal test of new innovation.

The worst feature of the new investment (apart from interstate rollingstock) was its timing which was largely politically motivated and occurred at a time of high interest rates.

Train running capital cost per seat kilometre and passenger kilometre

Whilst costs per seat kilometre and passenger kilometre are not charted, they broadly depict similar trends to those shown for passenger journeys.

Empirical Proposition 7B
Even though fleet modernisation improved the productivity of materials and other costs, failure management of the investment in rollingstock contributed to rapidly escalating capital costs and lost opportunities to innovate in NSW passenger markets.

7.5 TERMINAL (STATION) SUB-SYSTEM PPIs

7.5.1 Terminal (Station) Running Labour

Thousand passenger journeys per terminal (station) running labour

Figure 7.11 shows index numbers of terminal (station) running labour per thousand passenger journeys, where the base year, 1951/52 = 100, except in the case of Interurban, where the base year is 1958/59. As with train running labour there is an element of cyclicity where recessions tend to reduce patronage, without reducing the labour component of inputs. Also, as with train running labour, Suburban, Country and Interstate market segments have all shown long term growth in thousands of journeys per head of labour but not as much as the Interurban market segment. Again, the conclusion to be drawn from the data is that where there are rigidities in labour supply, a strongly growing market is a necessary requirement for labour productivity improvement. Another point to note is that productivity growth in train running labour has been about double that of terminal running labour. This leads to the further conclusion that terminal labour rigidities are much stronger than train running labour rigidities.

Empirical Proposition 8A

The extent of labour rigidities in terminal running are such that even a strong and sustained growth in demand for rail passenger services would be insufficient to meet the potential productivity growth which is possible. More radical solutions, such as job re-structuring, would be necessary which has happened since 1991/92.

Thousand passenger kilometres per terminal (station) running labour

Figure 7.12 shows index numbers of terminal (station) running labour per thousand passenger kilometres. As above, the index numbers have grown at about the same rate as in passenger journeys, with the exception of Country passenger kilometres, which are nearly double the rate reflecting the radical restructuring of services from 1988/89, and reinforcing the statement in Empirical Proposition 8.

Thousand seat kilometres per terminal (station) running labour

Figure 7.13 shows index numbers of terminal (station) running labour per thousand seat kilometres. As with passenger journeys and passenger kilometres, the productivity growth in seat kilometres per person is well below that of train running labour, due to the extra rigidities in the supply of terminal (station) labour. This further reinforces the statement in Empirical Proposition 8.

7.5.2 Terminal (Station) Running Materials and Other Cost

Terminal (station) running materials and other cost per passenger journey

Figure 7.14 shows index numbers of materials costs per passenger journey (1989/90 cents per journey). In all cases the index numbers decline by about half, which is not as dramatic as the decline in train running materials costs (over 80% in Suburban and Interurban). In the latter case fleet modernisation provided the main impetus for improved materials cost productivity. In the case of terminals and stations, materials costs have been influenced by deferred maintenance of old infrastructure, buildings etc., until major programs of rebuilding and upgrading were possible on capital budgets and new building materials with extended lifetimes and improved quality replaced old installations.

Empirical Proposition 9A

Improved quality of materials, construction methods etc., has had some impact upon the productivity of materials and other costs but not as dramatic as in the case of fleet modernisation.

Terminal (station) running materials and other costs per passenger kilometre

Figure 7.15 shows index numbers of materials and other cost per passenger kilometre (1989/90 cents per passenger kilometre). A similar pattern in the decline, to passenger journeys, is revealed, reinforcing the statement in Proposition 9.

Terminal (station) running materials and other costs per seat kilometre

Figure 7.16 shows index numbers of materials and other costs per seat kilometre (1989/90 cents per seat kilometre). As with costs per passenger journey and passenger kilometres, a similar pattern of decline is revealed, reinforcing the statement in Proposition 9.

7.5.3 Terminal (Station) Capital Cost

Terminal (station) capital cost per passenger journey

Table 7.2 illustrates the rise in capital cost relative to passenger journeys.

In the case of Suburban passenger journeys the cost index numbers rise to 471. In the case of Interurban the rise is to 267. In the case of Country the rise is 284, and in the case of Interstate the rise is 338. By comparison with train running capital costs, the rates of increase are much lower.

The principal reason for this relatively modest growth in capital cost is that apart from the Eastern Suburbs Railway, there was relatively little investment on stations and passenger terminals. Where new stations, platforms and other infrastructure was required (especially on the interurban network) new construction was low cost and relatively basic. Buildings were particularly utilitarian by comparison with earlier, more expansive eras of station building.

The exception was the Eastern Suburbs Railway. As we saw in Chapter 5, station design was close to state of the art in technical terms but with no discernible impact on the production function. It was a repetition of the failure management strategy applied to investment in new rollingstock.

The general conclusion which these data lead to is that, as with rollingstock, investment in terminal and station infrastructure failed the test of innovation in that it had no discernible effect on the production function despite the fact that stations on the Eastern Suburbs Railway were, technically, near to state of the art. In other cases of investment, costs were kept down by rudimentary and utilitarian structure which did little or nothing for passenger comfort.

Terminal (station) capital cost per seat kilometre and passenger kilometre

Whilst costs per seat kilometre and passenger kilometre are not charted, they broadly depict similar trends to those shown for passenger journeys.

Empirical Proposition 7C

Failure management of the investment in terminals and station infrastructure also led to increased capital costs and lost opportunities to innovate in NSW passenger markets.

7.6 CORRIDOR SUB-SYSTEM PPIs

7.6.1 Corridor (Variable Track Maintenance) Labour

Thousand passenger journeys per corridor (variable track maintenance) labour

Figure 7.17 shows index numbers of corridor (variable track maintenance: VTMC) labour per thousand passenger journeys. As with train running and terminal (station) labour, there has been a continuing long term growth in thousand journeys per head of labour. Note that the word "cost" does not mean costs are included. Instead it is a shorthand nomenclature to indicate activities to which labour is allocated.

The gains in productivity are similar to those in train running, indicating a reasonable degree of labour supply flexibility with the gains in Interurban apparently very substantial. This growth is a function of a combination of increasing demand and a restructuring of the labour force. The Empirical Proposition suggested by these conclusions is essentially a corollary of Proposition 1.

Empirical Proposition 8B

A strong and sustained growth in demand for a rail passenger service is a necessary requirement for a strong and sustained improvement in Corridor (VTMC) labour productivity. However, workforce restructuring can achieve an even greater productivity improvement.

Corridor (VTMC) labour per thousand passenger kilometre

Figure 7.18 shows index numbers of corridor (VTMC) labour per thousand passenger kilometres. Again the growth in index numbers follows the pattern revealed in costs per passenger journey, above. This reinforces Empirical Proposition 8.

Corridor (VTMC) labour per thousand seat kilometres

Figure 7.19 shows index numbers of corridor (VTMC) labour per thousand seat kilometres. Again, the growth in index numbers follows the same general pattern revealed in costs per passenger journey and passenger kilometres above. Proposition 8 is further reinforced.

7.6.2 Corridor (Fixed Cost) Labour

Thousand passenger journeys per corridor (Fixed Cost: FC) labour

Figure 7.20 shows index numbers of corridor (Fixed Cost, FC) labour per thousand passenger journeys. It may usefully be compared with corridor (VTMC) labour per thousand passenger journeys. The index number trends revealed in the figures for VTMC and FC, are similar, with the exception of Interurban services. Here FC growth is about half that of VTMC labour. In this instance at least, the suggestion is that FC labour supply may be more rigid than VTMC labour supply. However, this is not indicated with the other market segments. The general conclusion suggested is that similar rigidities exist, whether the labour is designated as working on variable or fixed maintenance. Now, Proposition 8 can be expanded, as follows:

Empirical Proposition 9B
A strong and sustained growth in demand for rail passenger services is a necessary requirement for a strong and sustained improvement in corridor labour productivity whether or not maintenance costs are designated as fixed or variable. However, workforce restructuring can achieve even greater productivity improvements.

Thousand passenger kilometres per corridor (FC) labour

Figure 7.21 shows index numbers of corridor (FC) labour per thousand passenger kilometres. Again, the growth in index numbers follows the pattern revealed in passenger journeys, above. This reinforces Proposition 9.

Thousand seat kilometres per corridor (FC) labour

Figure 7.22 shows index numbers of corridor (FC) labour per thousand seat kilometres. Again, the growth in index numbers follows the pattern revealed in passenger journeys and passenger kilometres, above. Proposition 9 is further reinforced.

7.6.3 Corridor Materials and Other Costs (VTMC)

Corridor materials and other costs (VTMC) per passenger journey

Figure 7.23 shows index numbers of corridor (VTMC) materials and other costs per journey (1989/90 cents per journey). These materials costs do not behave in the same way as those relating to train running and terminal (station) running. In the case of Interurban services, the gains in productivity are similar to those in train running and terminal (station) running. This is probably due to the gains in passenger numbers. In the case of the other three market segments, the trends are either towards an increase or a much slower decline in cost per passenger journey. These trends more truly reflect the situation where methods and materials used in maintaining track and other infrastructure have essentially remained the same in the last 40 years.

Empirical Proposition 10
Corridor maintenance is ripe for major technological improvement. Unless and until there are major large-scale technological changes in the quality of materials, maintenance methods etc., material cost productivity will not improve as it has with train running and terminal (station) running.

Corridor materials and other costs (VTMC)

These items were not indexed because the units were too small compared to other variables and not worth graphing. Nevertheless, the trends are expected to be the same as those recorded in passenger journeys, above.

7.6.4 Corridor Materials and Other Costs (FC)

Corridor materials and other costs (FC) per passenger journey

Figure 7.24 shows index numbers of corridor (FC) materials and other costs per journey (1989/90 cents per journey). Like VTMC these costs do not behave in the same way as those relating to train running and terminal (station) running. The index numbers for Suburban and Country corridor (FC) costs follow a similar pattern to those of corridor

(VTMC) costs. Interstate index number trends are about half that of VTMC, due to cost allocation procedures. The results therefore reinforce Empirical Proposition 10.

Corridor materials and other costs (FC) per passenger kilometre and per seat kilometre

These items were not indexed because the units were too small compared to other variables and not worth graphing. Nevertheless, the trends are expected to be the same as those recorded in passenger journeys, above.

7.6.5 Corridor Capital Cost

Corridor capital cost per passenger journey

Table 7.3 illustrates the rise in capital cost relative to passenger journeys.

In the case of Suburban passenger journeys, the cost index numbers rise to 238. In the case of Interurban, the rise is 152. In the case of Country, the rise is 101 and in case of Interstate, it falls by 1659.

By comparison with train running and terminal capital costs, the rates of increase are very much lower. The result of this is that the capital cost of train running in monetary terms, has caught up with, and in some cases overhauled corridor capital cost.

Market segment	Cost per passenger journey ($1989/90)	
	1951/52	1991/92
Suburban:		
Train Running	0.04	0.37
Corridor	0.54	1.29
Interurban:	(1958/59)	
Train Running	0.21	2.74
Corridor	5.88	8.91
Country:		
Train Running	4.24	19.04
Corridor	11.97	12.12
Interstate:		
Train Running	7.40	12.10
Corridor	23.43	3.89

This suggests, at first glance, a significant level of underinvestment in corridor infrastructure. However, investment in corridor spending requires very large quantities of capital. These quantities were much harder to justify to Government Treasuries. And, in the absence of very discernible productivity impacts of other investment, would have yielded an even worse result than train running or terminal (station) investment. An indication of this is given by the corridor component of the Eastern Suburbs Railways. As in the case of terminal (station) investment in that Railway, it was technically very advanced, and again had no discernible impact on the production function.

The general conclusion which these data lead to is that corridor investment costs were probably close to optimal in the period under review for the simple reason that any strategy of new investment in this area requires very substantial quantities of capital, which were not justifiable under any criteria. Nevertheless, this led to a significant mismatch between the high-performance rollingstock and the essentially 19th Century corridor along which this rollingstock was expected to operate.

Corridor capital cost per seat kilometre and passenger kilometre

Whilst costs per seat kilometre and passenger kilometre are not charted, they broadly depict similar trends to those shown for passenger journeys.

Empirical Proposition 7D
The failure management of investment in terminals, stations and rollingstock did not extend to corridors simply because the quantity of investment capital required was too great to justify on any criteria and was, therefore, not spent.

7.7 BUSINESS AND CORPORATE ADMINISTRATION SUB-SYSTEM PPIs

7.7.1 Business and Corporate Administration Labour

B and C administration labour per thousand passenger journeys

Figure 7.25 shows index numbers of business and corporate (B & C) overheads labour per thousand passenger journeys. In contrast to all other labour indexes there has been a decline in thousands of journeys per head of labour in three market segments and a static situation in one. The Figure shows the marked difference between the B and C Administration trends and those of the other sub-systems. Furthermore, the trends have diverged since the late 1960s when a succession of major reorganisations commenced. Each reorganisation tended to increase labour numbers in the B and C Administration sub-system. Most of the jobs created in these reorganisations were essentially peripheral to the "core business" of maintaining and running the railways, and represented a steady accretion of essentially bureaucratic functions that had no measurable impact on output from the B and C Administration function.

Empirical Proposition 11

A strong and sustained growth in demand for rail passenger services is necessary simply to ensure that business and corporate administration labour productivity does not decline. Again, workforce restructuring could achieve the required productivity improvement.

B and C administration labour per thousand passenger kilometres

Figure 7.26 shows index numbers of B and C Administration labour per thousand passenger kilometres. Suburban and Interurban index numbers follow the trends of passenger journeys. Country index numbers have grown at the same rate as terminal sub-system index numbers, but both are well below the trends of the other sub-systems. Both reflect the restructuring of services from 1988/89. Interstate index numbers are essentially the same as passenger journeys—a mere 10 index points growth since 1951/52.

In conclusion, the labour per thousand passenger kilometres indexes generally reinforce Empirical Proposition 11.

B and C administration labour per thousand seat kilometres

Figure 7.27 shows index numbers of B and C Administration labour per thousand seat kilometres. Country and Interstate index numbers follow the declining trends shown in passenger journeys, the decline being particularly pronounced in the case of Interstate journeys. Suburban index numbers are marginally above 100, suggesting that even the substantial increase in Suburban seat kilometres is largely negated by the rise in B and C Administration labour numbers. Interurban index numbers have remained on 100. Again, these labour indexes generally reinforce Empirical Proposition 11.

7.7.2 Business and Corporate Administration Materials and Other Costs

Business and Corporate admin. materials and other costs per passenger journey

Figure 7.28 shows index numbers of B and C Administration materials and other costs per passenger journey (1989/90 cents per journey). Again, in contrast to all other materials cost indexes, there has been a marked decline in productivity. However, it needs to be noted that in this item, in the B and C Administration sub-system, the "Other" category, in "Materials and Other", tends to be something of a sink-hole for a miscellany of costs not found in the other sub-systems. Essentially these may be thought of as costs associated with the accretion of a bureaucracy. Again, as labour numbers have increased, materials and other costs productivities have declined, in the ratio of about four to one—for every unit decrease in labour productivity, there has been a four unit decrease in materials etc., productivity. This represents a major "second order" decline in productivity resulting from the initial addition of labour numbers to the B and C Administration sub-system.

Empirical Proposition 12

As a corollary to Proposition 11, it is likely that only workforce restructuring would achieve productivity improvement in Business and Corporate Administration. This is because Materials and Other Costs are a very significant "second order" cost burden arising from the initial increase in labour numbers.

Business and corporate administration materials and other costs per passenger kilometre

Figure 7.29 shows index numbers of B and C Materials and other costs per passenger kilometre (1989/90 cents). The numbers support the conclusion in passenger journeys, above.

Business and corporate administration materials and other costs per seat kilometre

Figure 7.30 shows index numbers of B and C Administration Materials and Other costs per seat kilometre (1989/90 cents). Again, the numbers support the conclusion in passenger journeys, above.

7.7.3 Business and Corporate Administration Capital Cost

Business and corporate administration capital cost per passenger journey

Table 7.4 illustrates the rise in capital cost relative to passenger journeys.

In the case of Suburban passenger journeys, the cost index numbers rise to 387.

In the case of Interurban, the rise is 309. In the case of Country, the rise is 252 and in the case of Interstate, it is 261. These are lower than train running or terminal (station) capital cost increases but higher than those of corridor cost increases.

There is a correspondence between the rise in Business and Corporate Administration staff numbers, mentioned above, and the buildings needed to house them, and the equipment and other capital items needed to support them. As with all other Business and Corporate Administration Costs, this is an inevitable consequence of increases in the non-core activities of running and maintaining the railway. As with Materials, Capital Costs are, therefore, a very significant "second order" cost burden arising from the initial increase in Business and Corporate Administration labour numbers.

Business and corporate administration capital cost per seat kilometre and passenger kilometre

Whilst costs per seat kilometre and passenger kilometre are not charted, they broadly depict similar trends to those shown for passenger journeys.

Empirical Proposition 13
Also as a corollary to Proposition 11, it is likely that only workforce restructuring would achieve productivity improvement in Business and Corporate Administration. This is because Capital Costs here are a very significant "second order" cost burden arising from the initial increase in labour numbers.

7.8 THE WORKING HYPOTHESES

In this Section the empirical Propositions are consolidated into four Working Hypotheses, covering the four inputs of Labour, Capital, Fuel and Materials and Other Costs.

7.8.1 Working Hypothesis I: Labour Productivity

This Working Hypothesis consolidates the Empirical Propositions relating to Labour:

A strong and sustained growth in demand for rail passenger services is a necessary requirement for a strong and sustained improvement in all passenger railway labour productivity. However, a number of past strategies have created conditions where even strong and sustained growth in demand is not sufficient to improve productivity and a more radical restructuring of labour and service output is suggested. These past strategies were:

- The creation of significant excess capacity in the number of seat kilometres supplied particularly in the off-peak period.
- Successive reorganisations of the NSW Railways which have resulted in the accretion of bureaucracies in the Business and Corporate Administration sub-system.

A strong and sustained growth in all passenger railway labour productivity requires the removal of the conditions defined in Overarching Hypotheses I to IV.

7.8.2 Working Hypothesis II: Capital Productivity

This Working Hypothesis consolidates the Empirical Propositions relating to Capital:

A strong and sustained growth in demand for rail passenger services is a necessary requirement for improvement in passenger railway capital productivity. Very substantial investment in fleet modernisation led to a very substantial increase in the cost of capital per unit of output, which outweighed productivity gains from materials and other costs. Modest investment in corridor infrastructure meant that a mismatch now exists between high-performance "state of the art" rollingstock and essentially 19th Century corridor infrastructure which if upgraded may not yield sufficient benefits to cover the cost of upgrading. As in the case of Business and Corporate Administration's materials and other cost, capital cost increases are a "second order" consequence of the accretion of bureaucracy mentioned in Working Hypothesis I.

7.8.3 Working Hypothesis III: Fuel Productivity

This Working Hypothesis consolidates the Empirical Propositions relating to Fuel:

The introduction of new rollingstock with more powerful motors and engines has led to an increase in fuel consumption per unit of output. A necessary condition for the optimisation of fuel consumption is an increase in ridership and some further attention to fuel conservation methods. A strong and sustained growth in all passenger railway fuel productivity requires the removal of the conditions defined in Overarching Hypotheses I to IV.

7.8.4 Working Hypothesis IV: Materials and Other Costs

This Working Hypothesis consolidates the Empirical Propositions relating to Materials and Other Costs:

Whilst fleet modernisation has had a very significant impact on materials and other cost productivity, this has been less so in terminals and stations sub-system, and very much less so in the corridor sub-system. In these latter sub-systems, large scale innovation is needed in the type of materials used (especially in their quality), maintenance methods etc. In the case of the Business and Corporate Administration sub-system, the low level of productivity in the usage of materials and other costs is a "second order" consequence of the accretion of bureaucracy mentioned in Working Hypothesis I. Again, a strong and sustained growth in Materials and Other Cost productivity requires the removal of the conditions defined in Overarching Hypotheses I to IV.

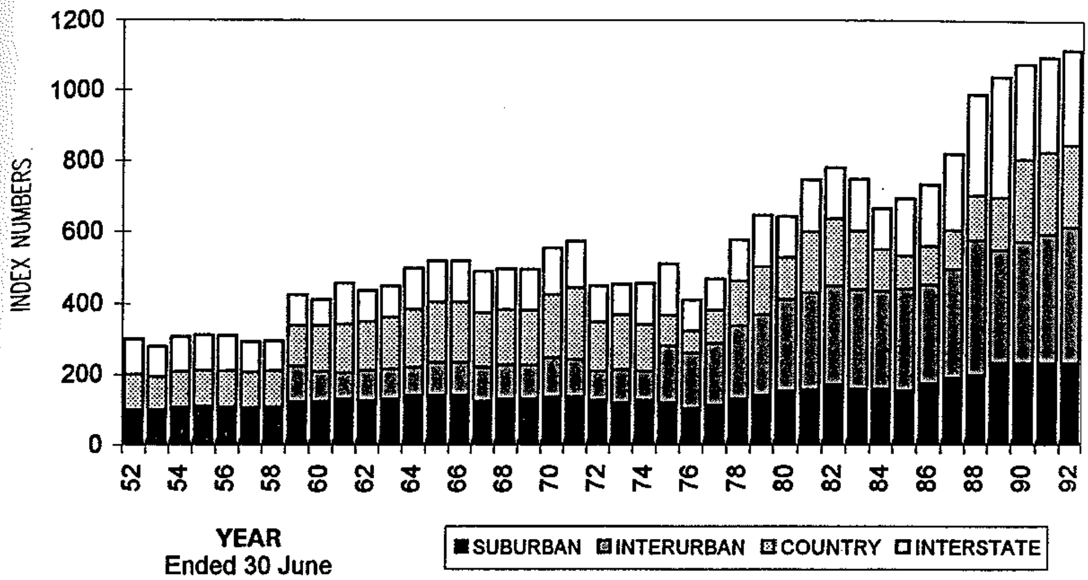

Figure 7.2 Thousand passenger journeys per train running labour

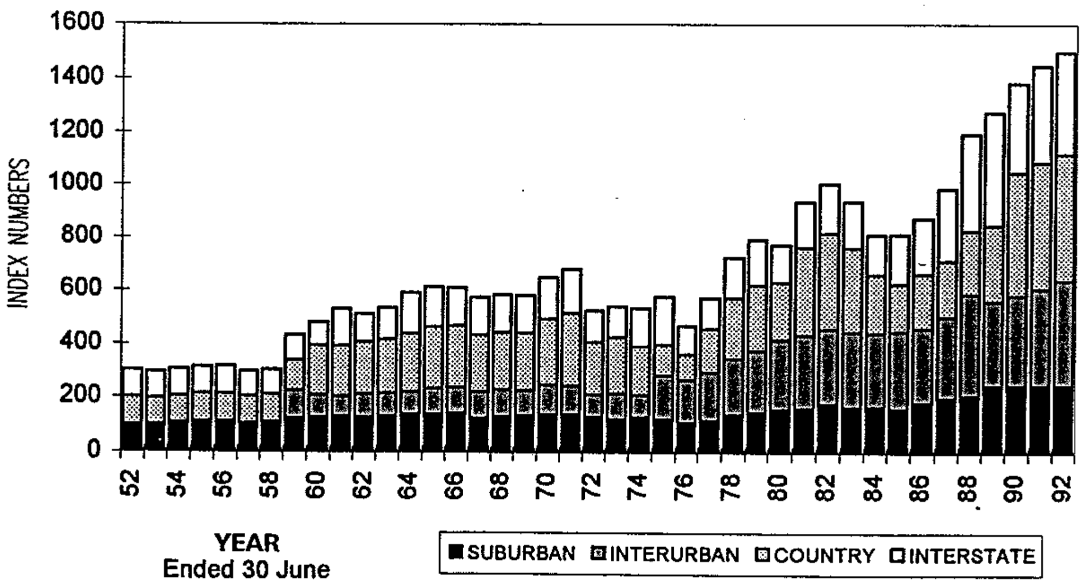

Figure 7.3 Thousand passenger kilometres per train running labour

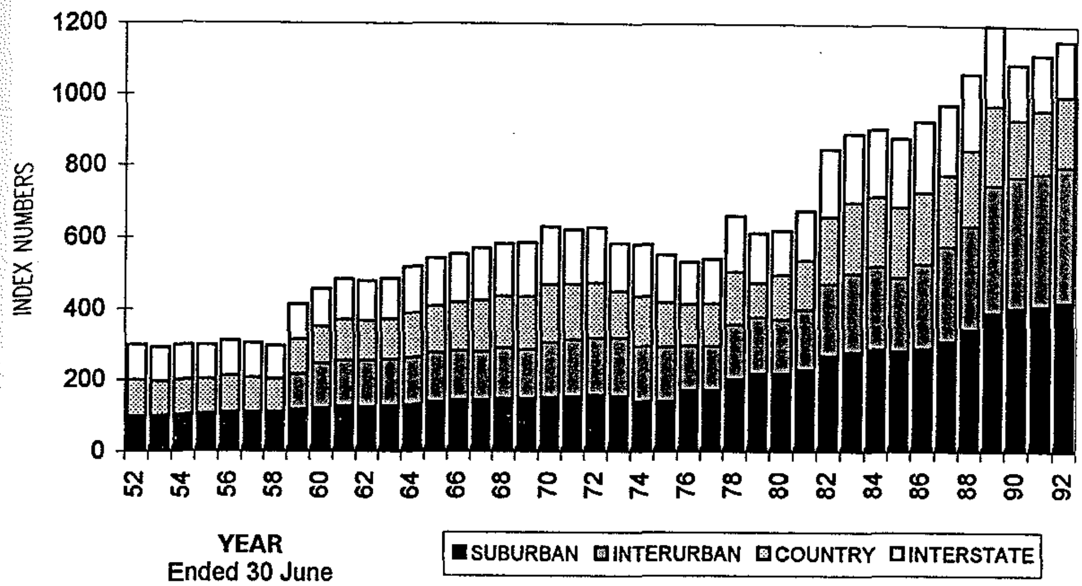

Figure 7.4 Thousand seat kilometres per train running labour

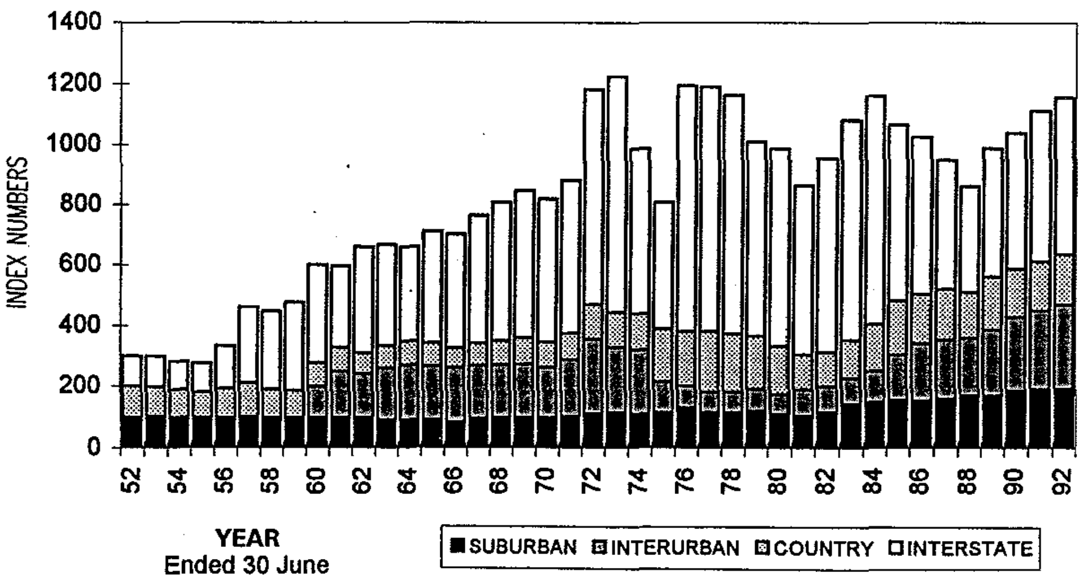

Figure 7.5 Train running fuel consumption (gigajoules) per passenger journey

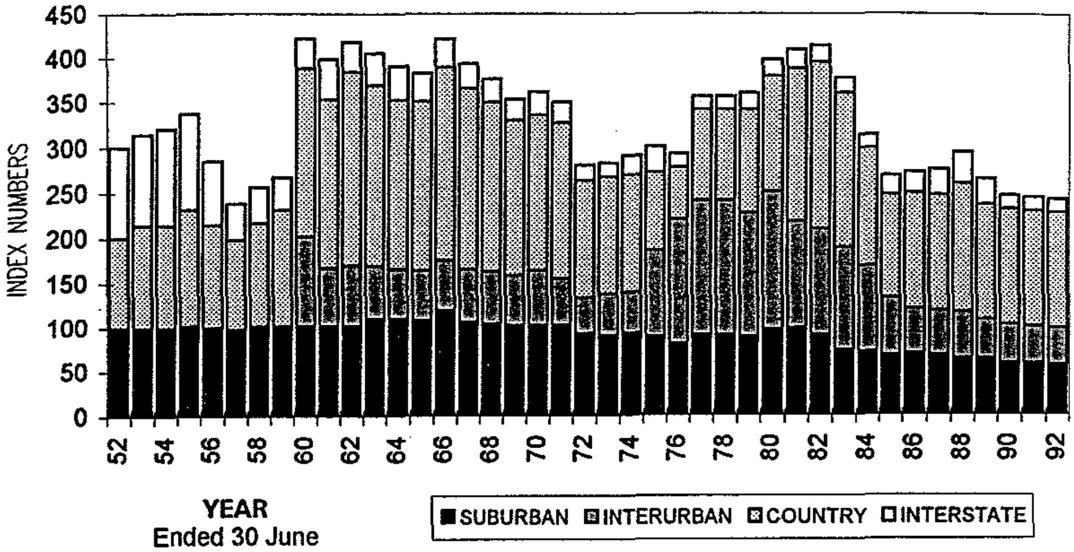

Figure 7.6 **Passenger kilometres per gigajoule of fuel**

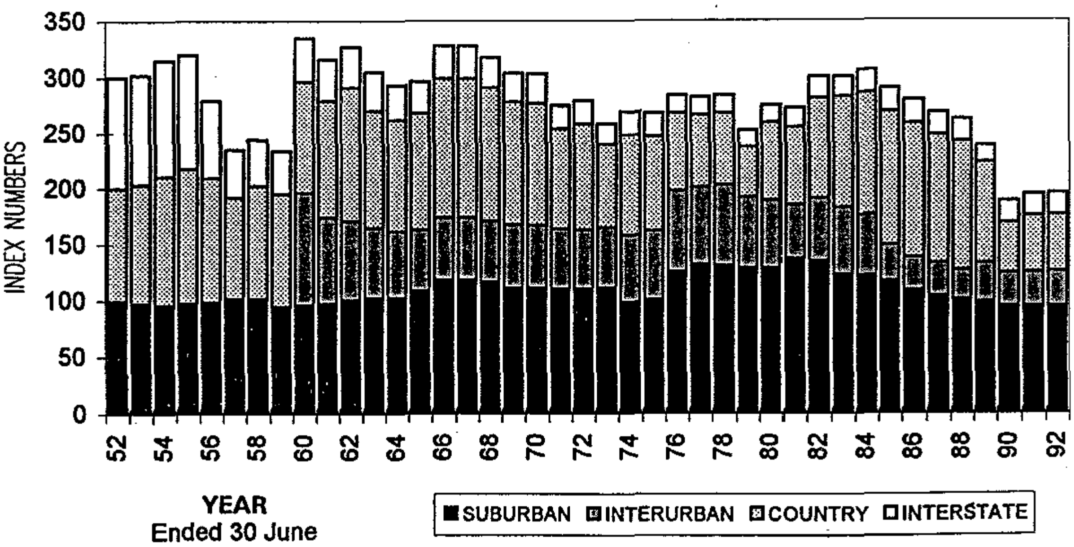

Figure 7.7 **Seat kilometres per gigajoule of fuel**

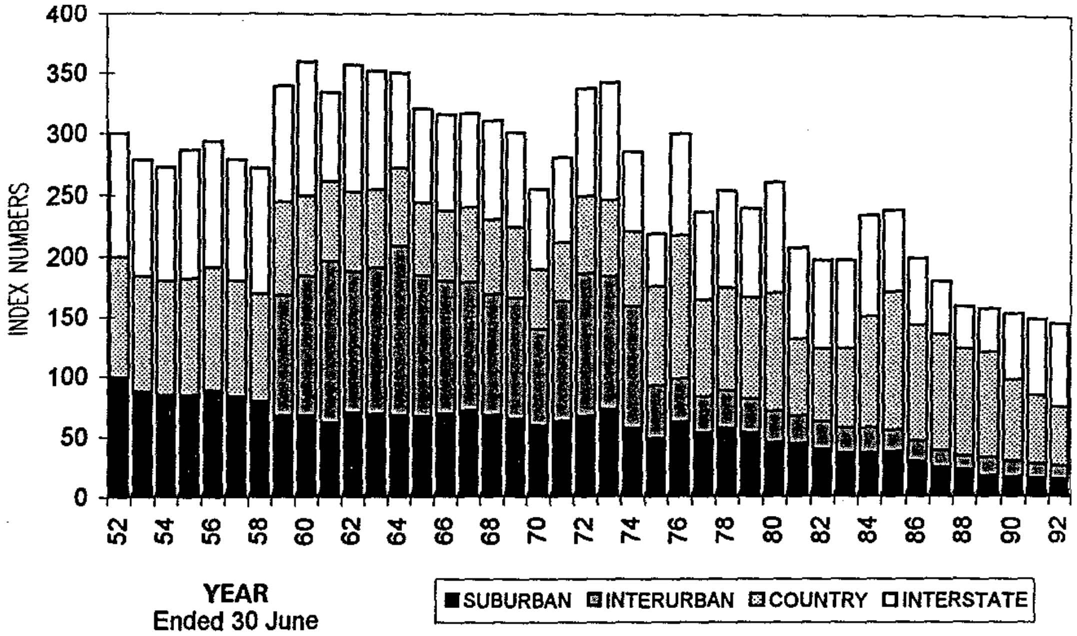

Figure 7.8 Train running materials and other cost per passenger journey

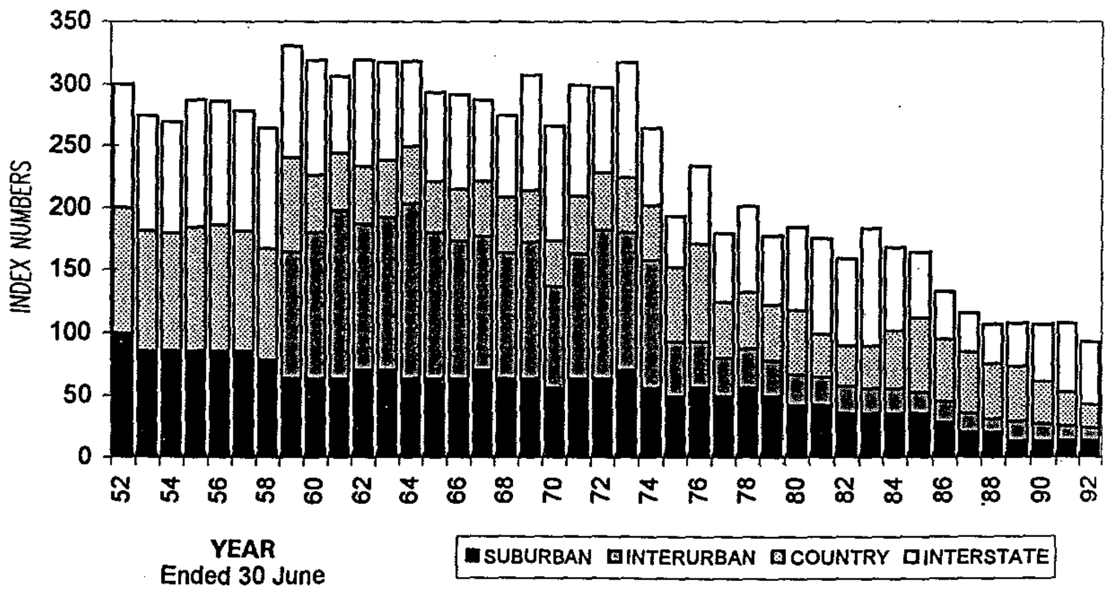

Figure 7.9 Train running materials and other cost per passenger kilometre

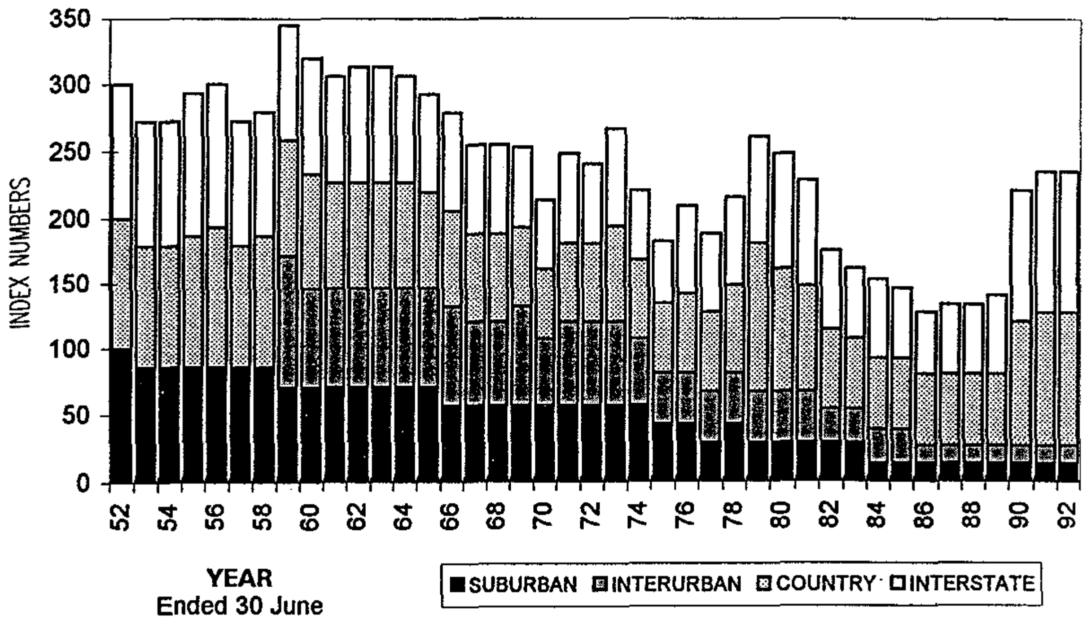

Figure 7.10 Materials and other cost per seat kilometre

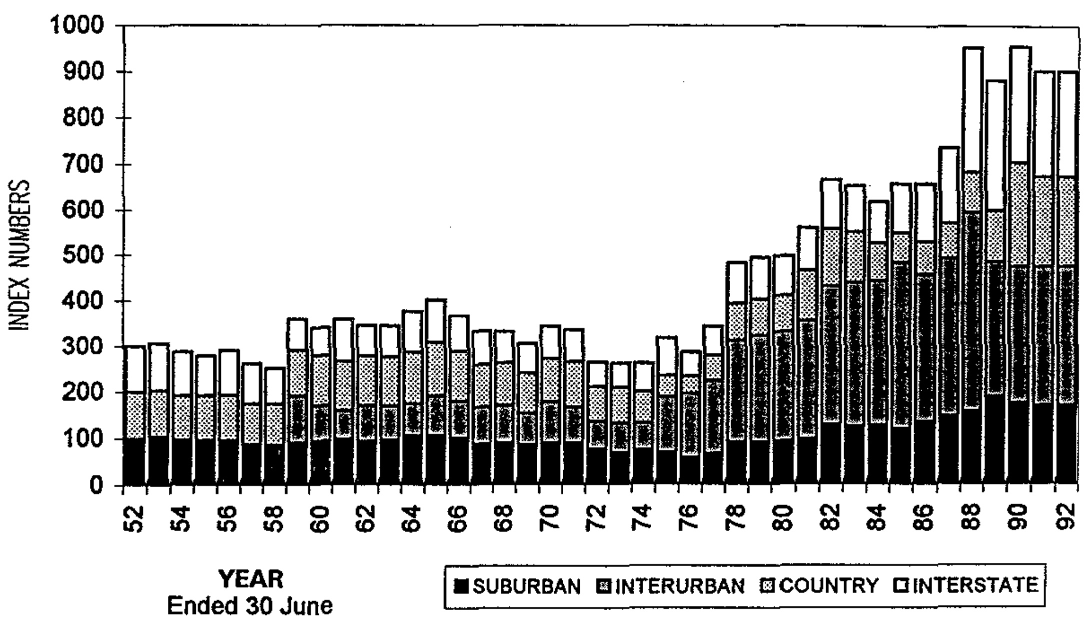

Figure 7.11 Terminal (station) running labour per thousand passenger journeys

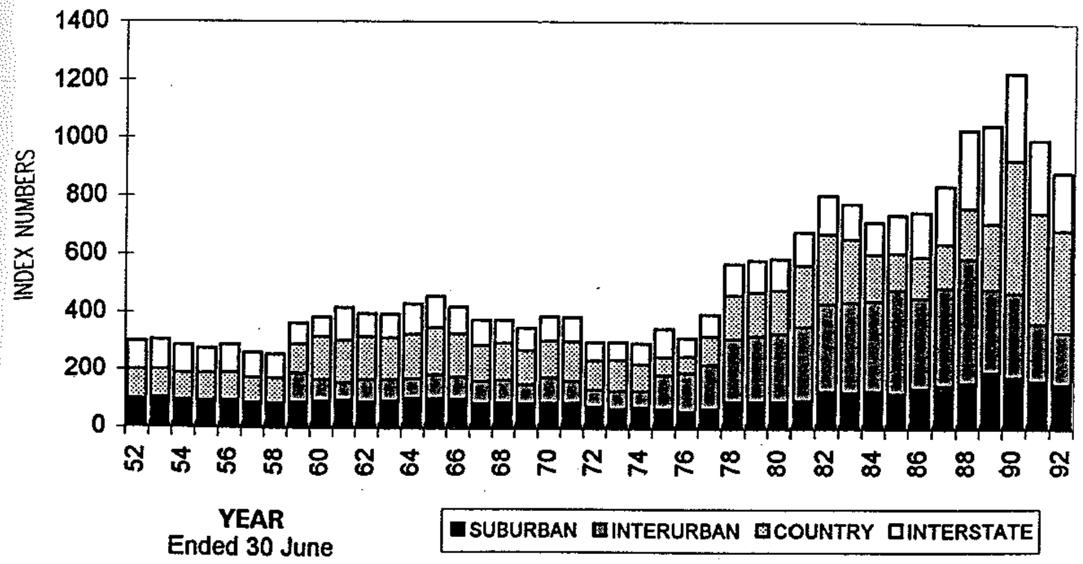

Figure 7.12 Terminal (station) running labour per thousand passenger kilometres

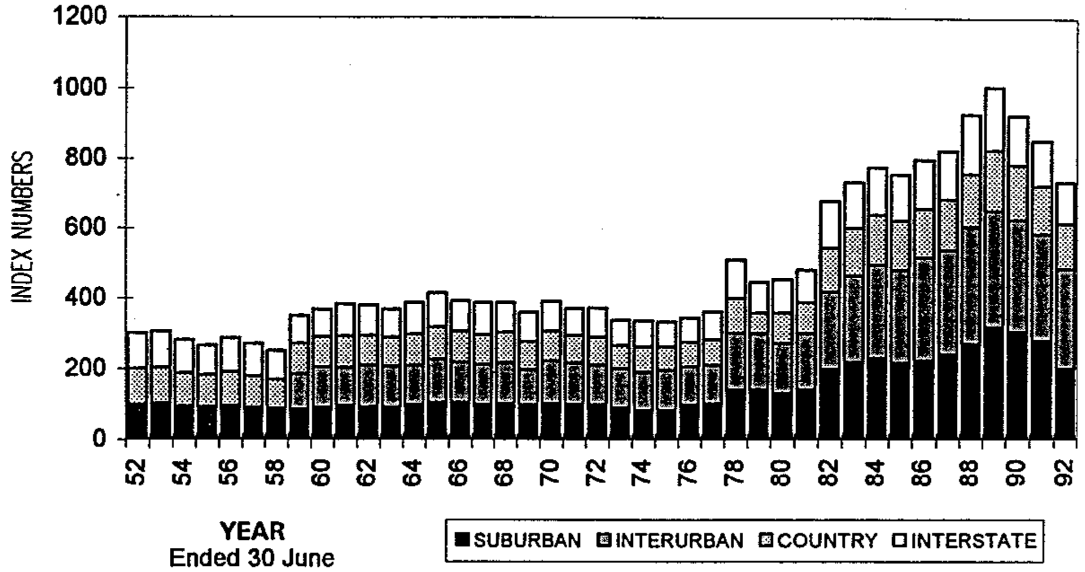

Figure 7.13 Terminal (station) running labour per thousand seat kilometres

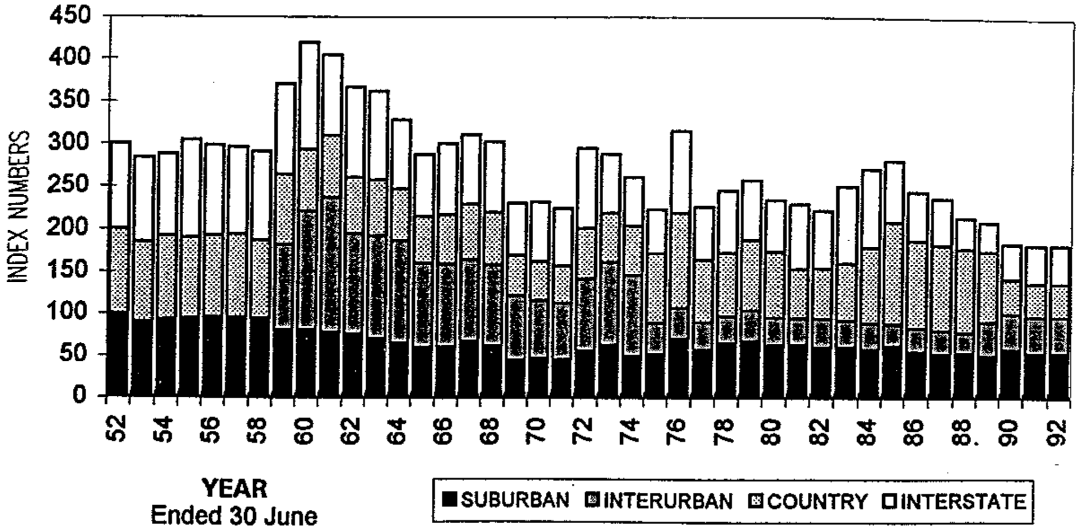

Figure 7.14 Terminal running materials and other cost per passenger journey

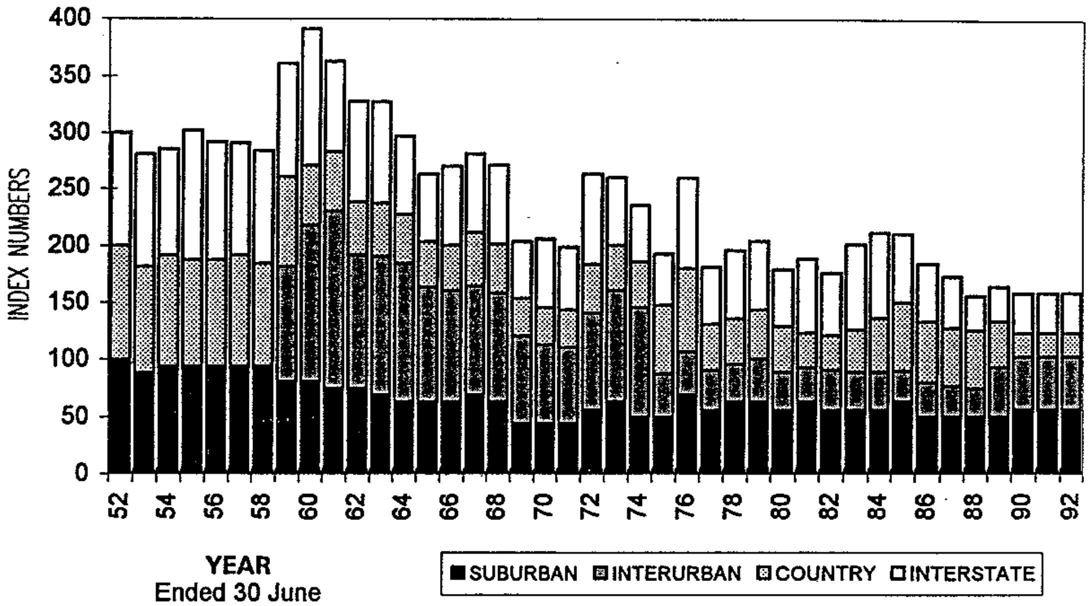

Figure 7.15 Terminal running materials and other cost per passenger kilometre

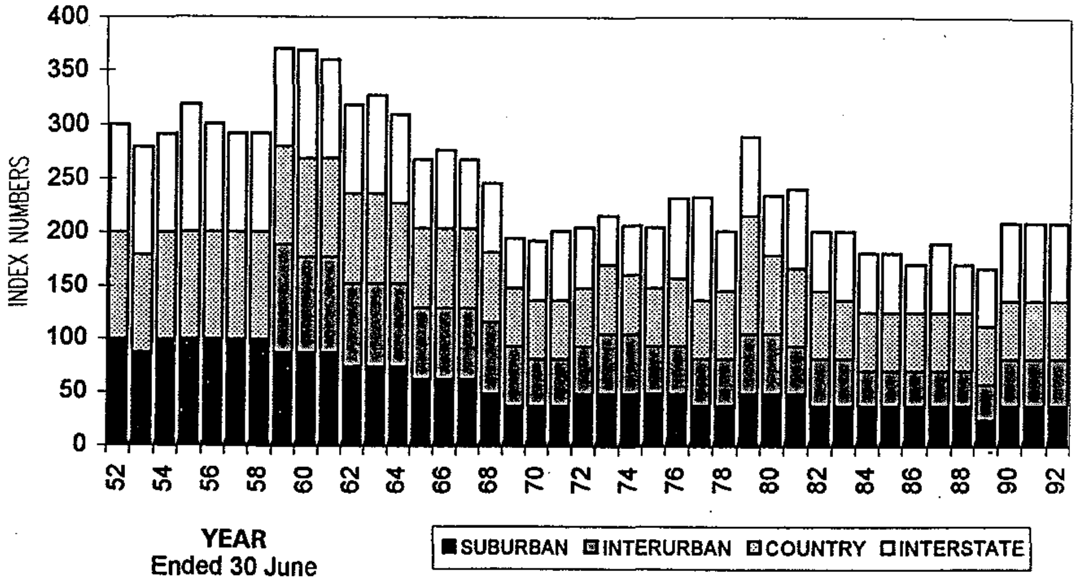

Figure 7.16 Terminal running materials and other cost per seat kilometre

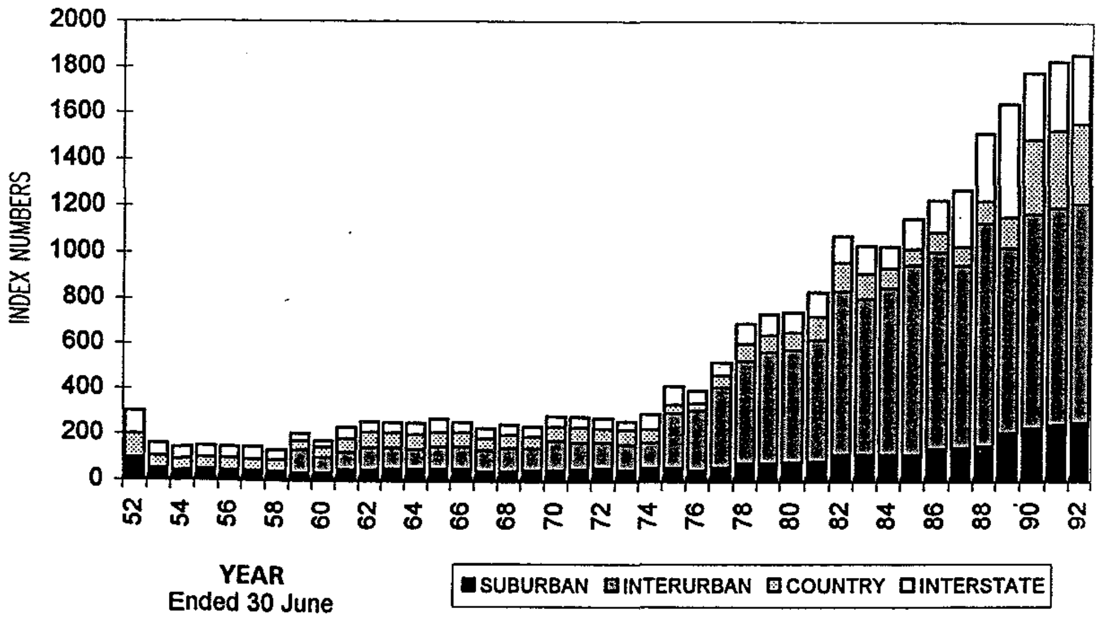

Figure 7.17 Corridor labour VT maintenance cost per thousand passenger journeys

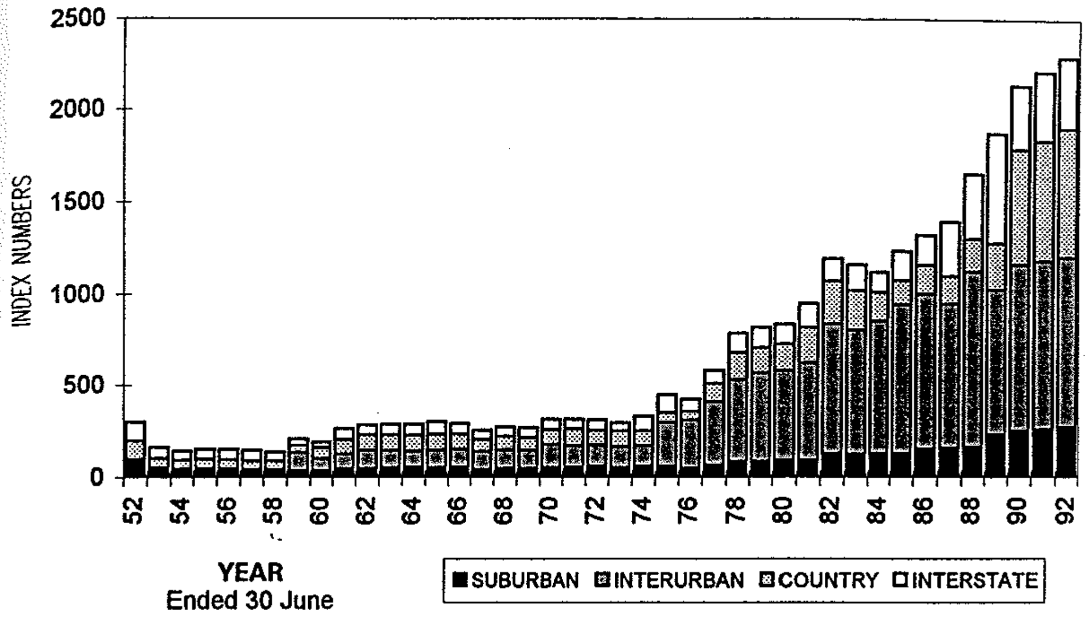

Figure 7.18 Corridor labour VT maintenance cost per thousand passenger kilometres

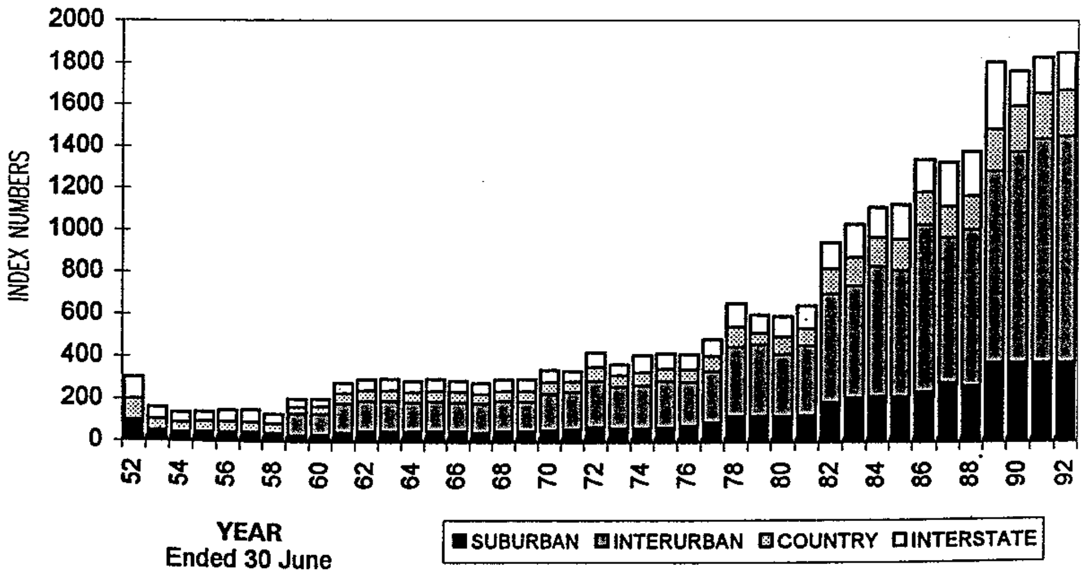

Figure 7.19 Corridor labour VT maintenance cost per thousand seat kilometres

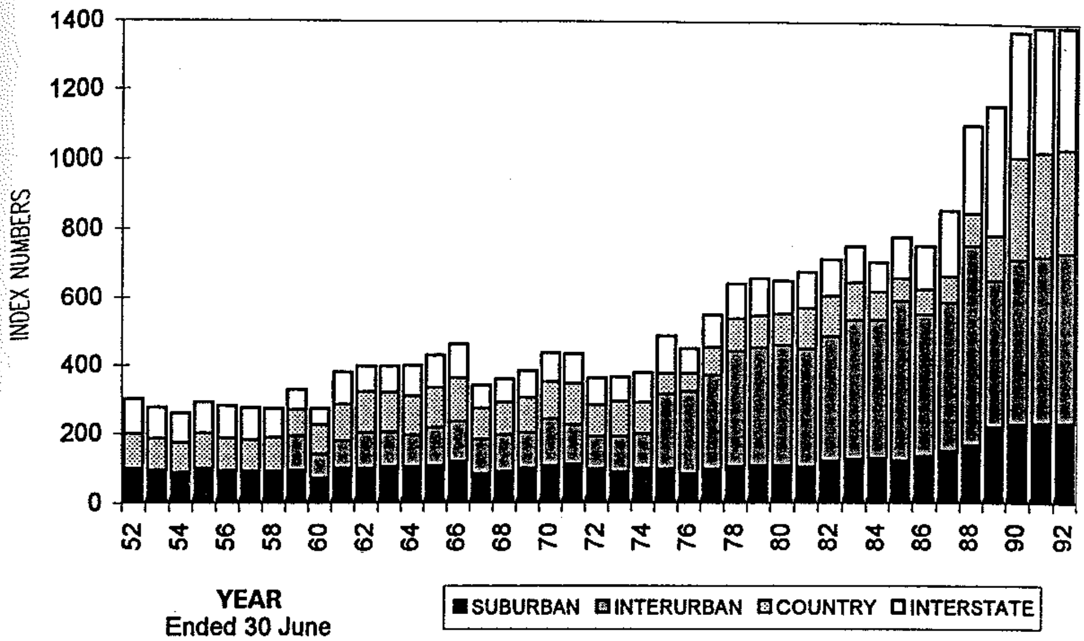

Figure 7.20 Corridor labour fixed corridor cost per thousand passenger journeys

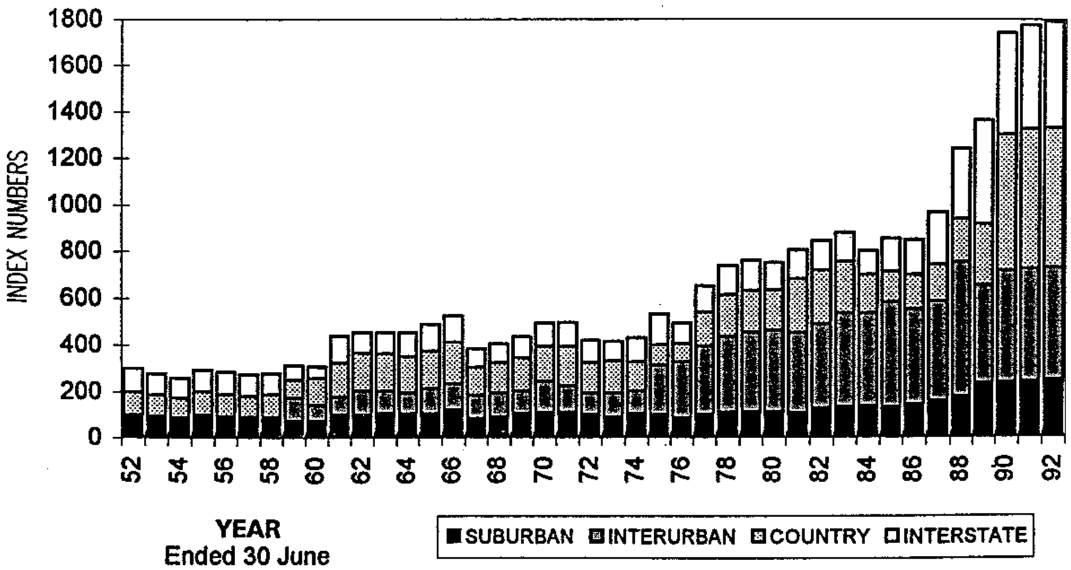

Figure 7.21 Corridor labour fixed corridor cost per thousand passenger kilometres

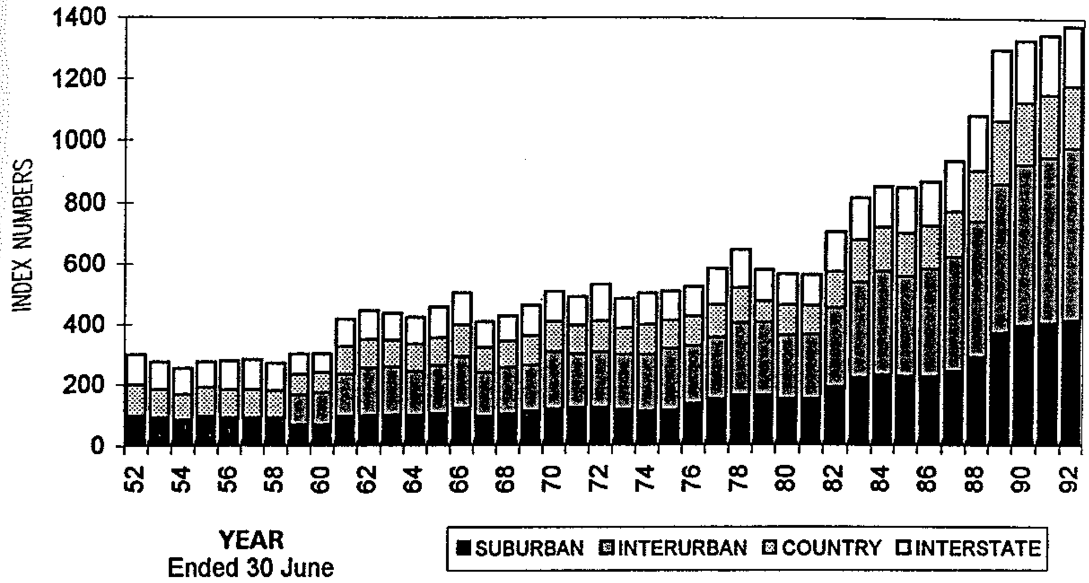

Figure 7.22 Corridor labour fixed corridor cost per thousand seat kilometres

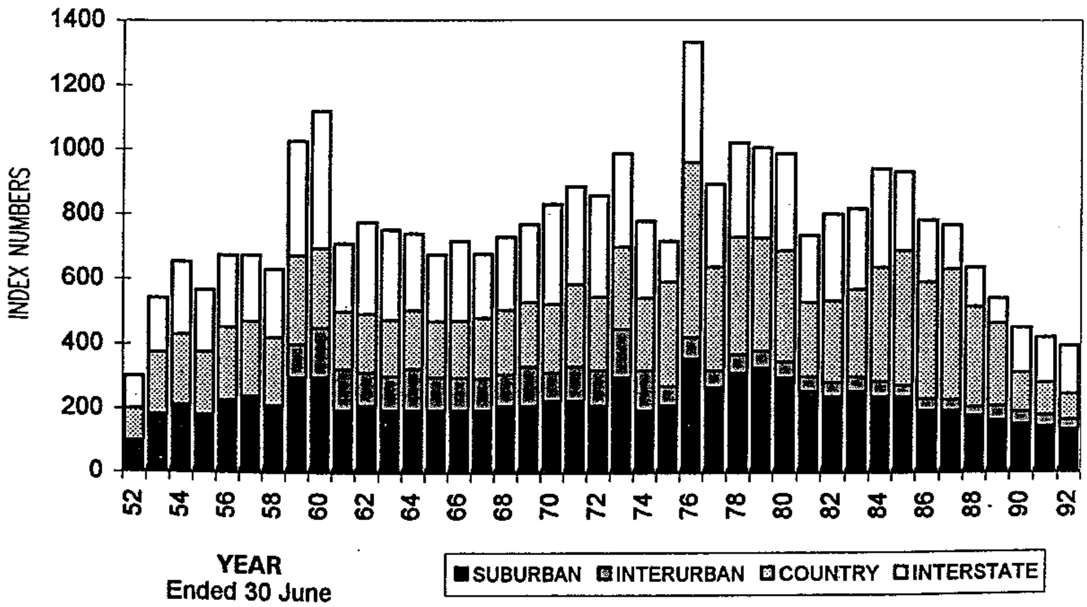

Figure 7.23 Corridor materials/other cost (VTM) per passenger journey

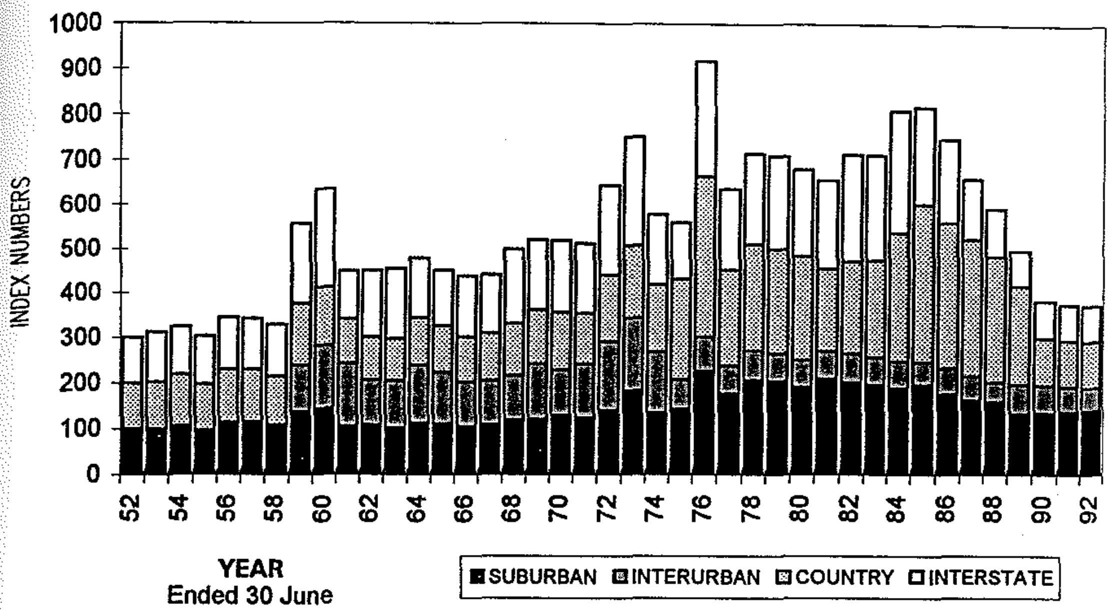

Figure 7.24 Corridor materials/other cost (fixed) per passenger journey

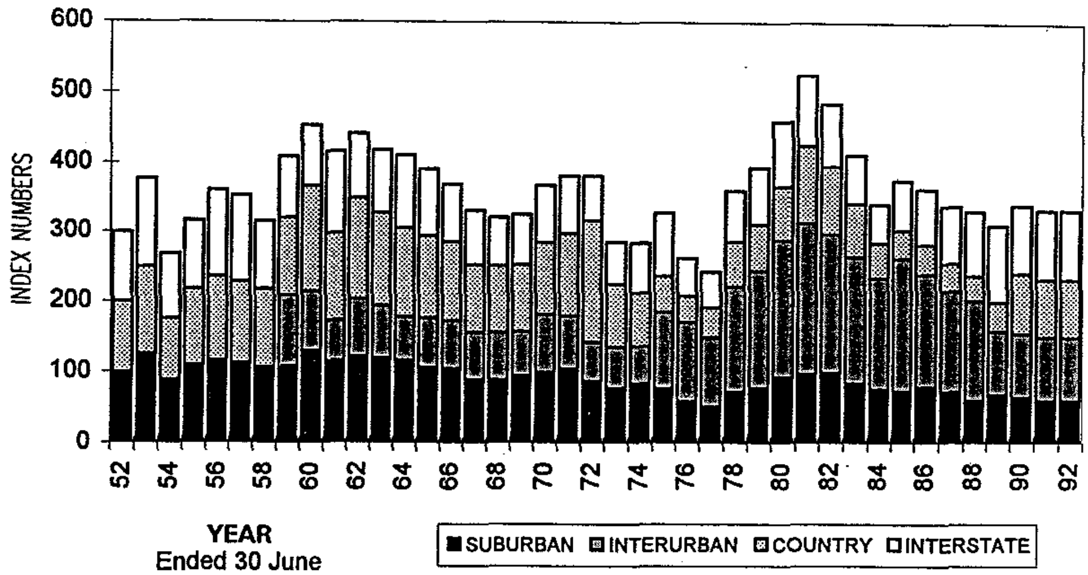

Figure 7.25 Business and corporate administration labour per thousand passenger journeys

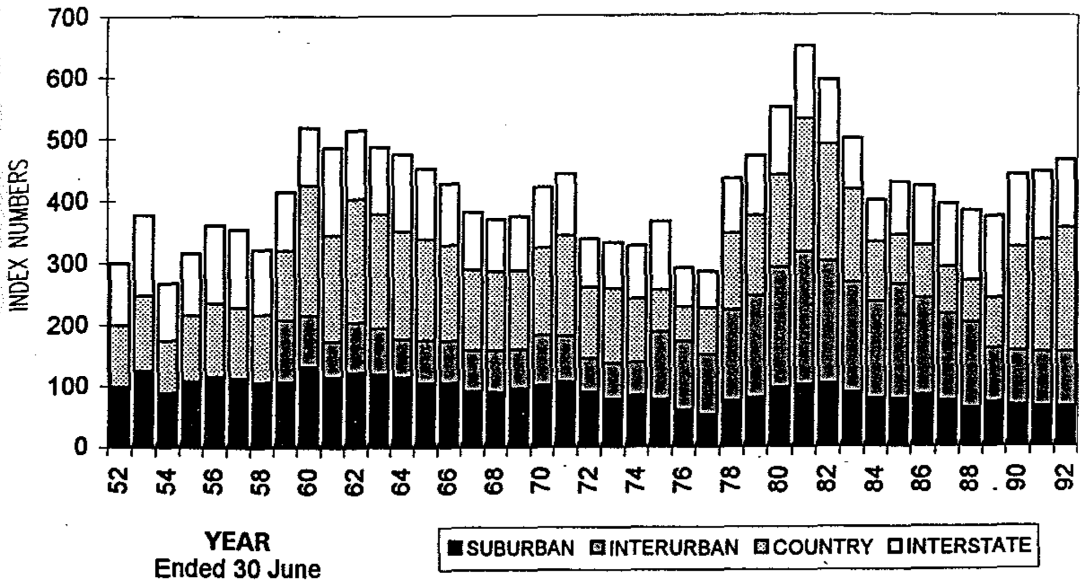

Figure 7.26 **Business and corporate administration labour per thousand passenger kilometres**

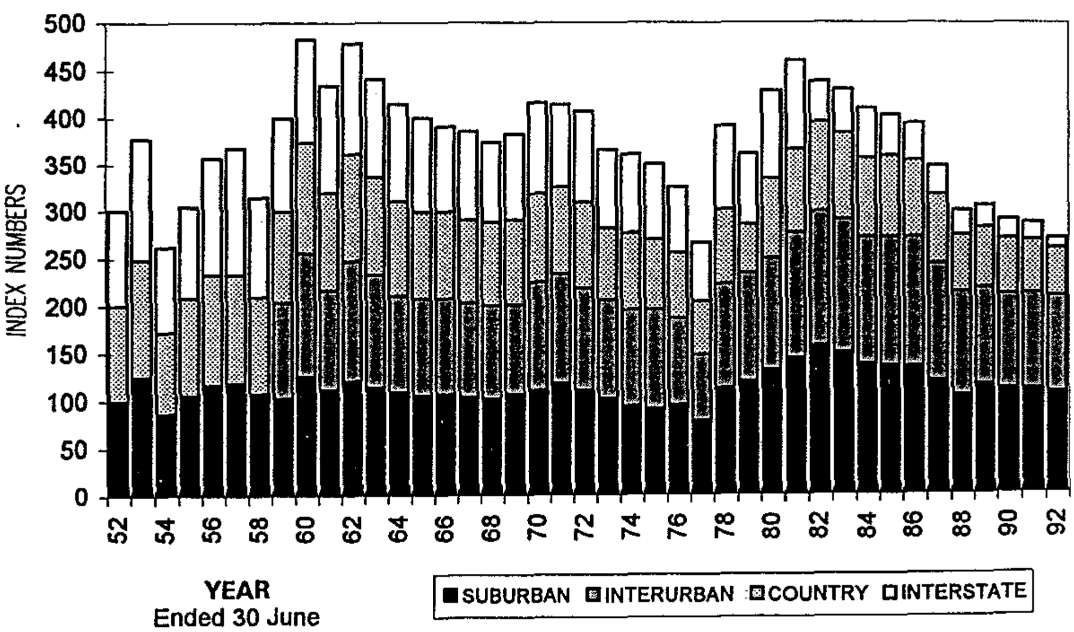

Figure 7.27 **Business and corporate administration labour per thousand seat kilometres**

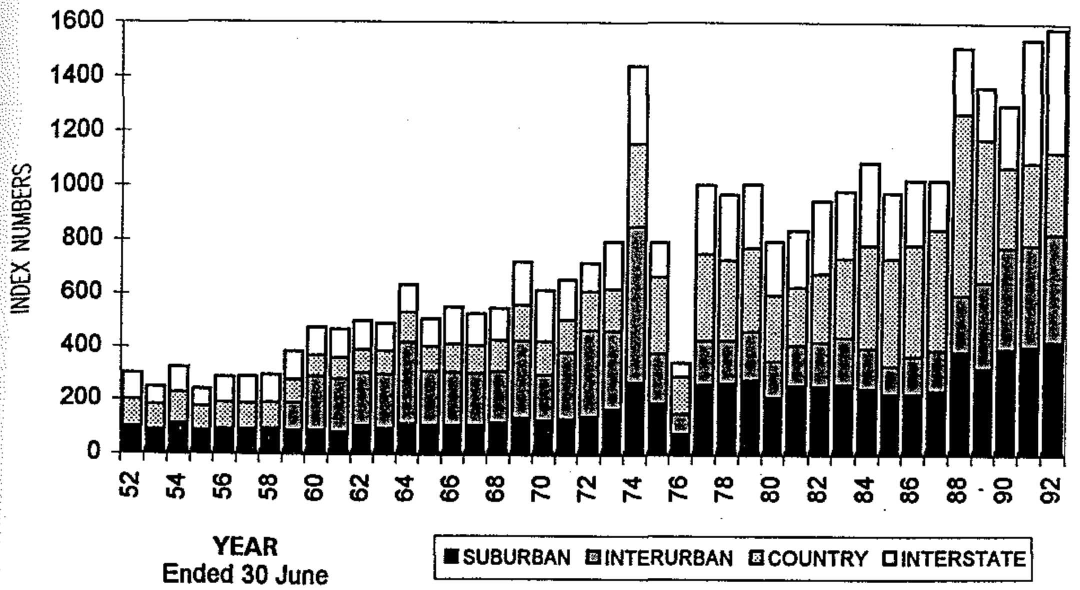

Figure 7.28 Business and corporate administration materials and other cost per passenger journey

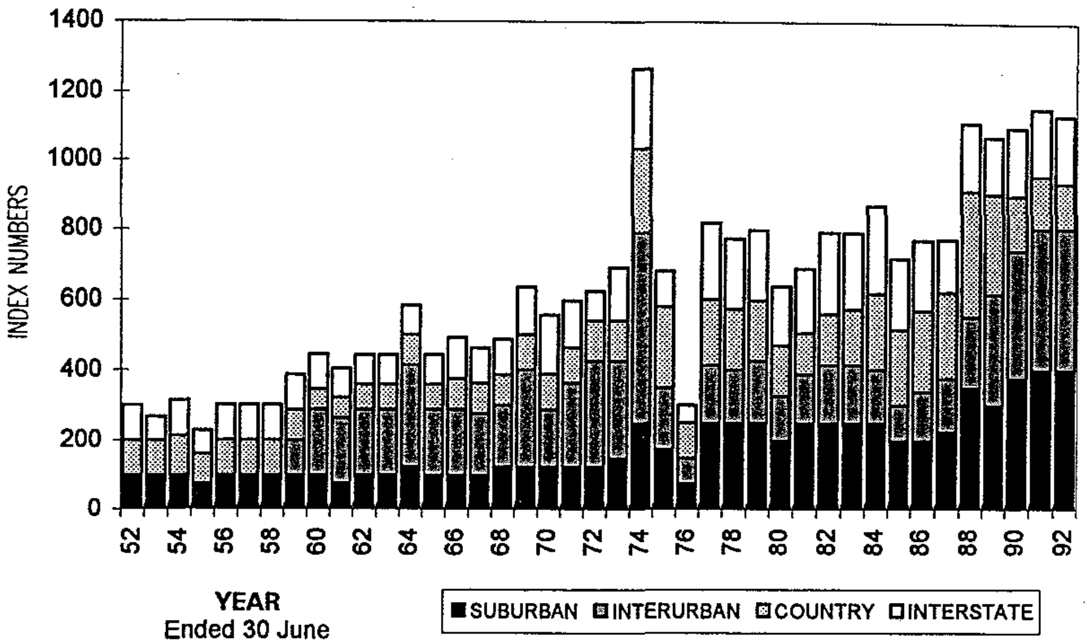

Figure 7.29 Business and corporate administration materials and other cost per passenger kilometre

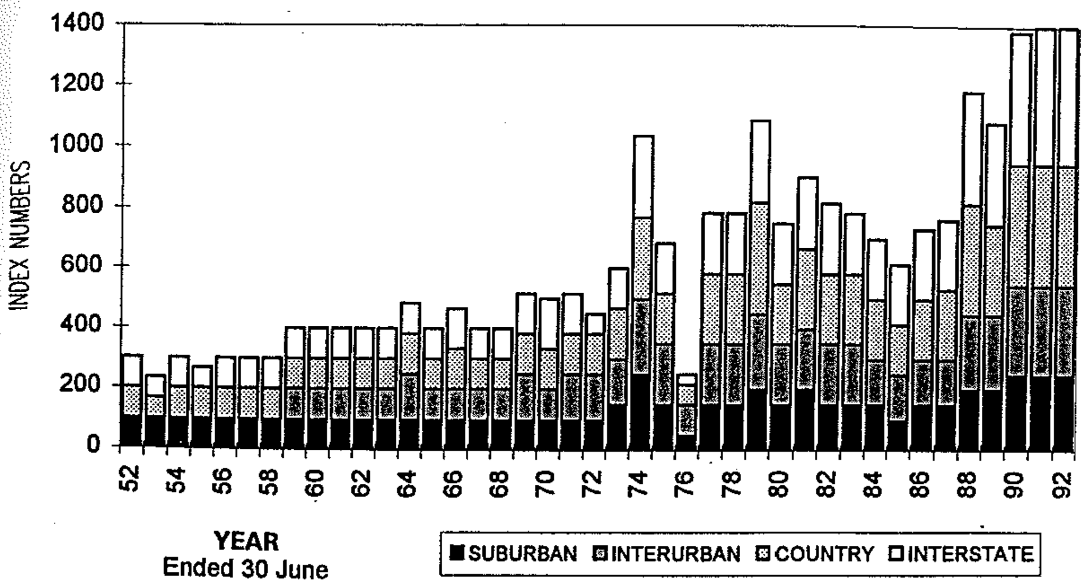

Figure 7.30 Business and corporate administration materials and other cost per seat kilometre

Table 7.1 **Capital input cost: train running sub-system 1951/52 to 1991/92 ($M 1989/90)**

Year ended 30 June	Suburban	Interurban	Country	Interstate
1952	8.8	-	31.2	6.6
1953	8.4	-	27.4	5.6
1954	8.8	-	24.8	5.2
1955	9.0	-	23.4	4.9
1956	9.4	-	22.0	4.6
1957	8.5	-	17.7	3.7
1958	7.8	-	14.9	3.7
1959	6.9	0.4	15.1	4.0
1960	5.8	0.7	13.9	4.4
1961	5.8	0.8	13.7	3.5
1962	5.4	0.8	11.9	4.2
1963	4.7	0.7	10.5	3.4
1964	5.2	0.7	11.6	3.2
1965	5.8	0.8	12.0	3.4
1966	6.5	0.8	12.7	3.5
1967	6.9	0.9	12.9	3.5
1968	6.5	0.8	12.2	3.4
1969	7.2	1.0	13.5	3.7
1970	8.2	1.0	16.3	4.7
1971	9.0	1.1	17.8	5.4
1972	8.9	1.1	17.8	5.4
1973	11.4	1.6	20.2	8.1
1974	16.6	2.5	27.8	8.5
1975	17.8	2.6	28.3	8.8
1976	21.0	2.6	28.2	10.2
1977	28.8	3.8	27.7	10.6
1978	36.6	5.7	28.5	10.5
1979	44.9	7.5	32.1	10.2
1980	60.0	8.8	39.5	12.2
1981	75.1	11.8	42.9	15.2
1982	95.2	16.5	66.1	18.7
1983	103.4	21.4	68.2	17.2
1984	91.2	19.3	78.5	15.1
1985	108.5	20.2	78.5	11.0
1986	108.1	25.2	69.1	8.0
1987	109.3	29.0	64.3	5.3
1988	116.1	27.7	62.5	4.7
1989	106.4	42.7	58.4	5.4
1990	102.7	40.2	47.6	8.1
1991	87.3	37.4	37.7	7.5
1992	77.6	33.4	34.1	6.7

Table 7.2 **Capital input cost: corridor sub-system 1951/52 to 1991/92 ($M 1989/90)**

Year ended 30 June	Suburban	Interurban	Country	Interstate
1952	123.0	-	88.2	20.9
1953	112.0	-	84.1	19.2
1954	114.1	-	85.6	19.5
1955	123.2	-	90.2	23.7
1956	144.4	-	103.6	24.6
1957	129.1	-	92.6	21.8
1958	122.5	-	85.6	23.2
1959	112.3	11.4	80.2	25.2
1960	109.1	15.7	68.9	28.9
1961	113.1	19.9	76.0	20.5
1962	111.5	15.5	69.1	26.7
1963	100.0	14.3	65.3	24.6
1964	103.3	16.9	69.5	21.0
1965	110.8	15.4	73.0	22.0
1966	108.3	15.6	73.0	24.4
1967	102.7	14.7	71.2	20.9
1968	98.9	14.5	69.9	21.9
1969	110.0	18.7	79.4	24.8
1970	132.9	19.8	98.9	30.0
1971	134.9	23.5	102.6	32.2
1972	123.9	21.2	92.4	26.3
1973	155.0	20.8	102.3	27.5
1974	190.2	37.3	148.8	37.2
1975	184.1	33.8	127.8	30.0
1976	206.0	37.4	93.7	37.4
1977	228.0	38.0	91.3	34.0
1978	199.0	35.0	83.8	33.2
1979	212.4	38.0	94.9	34.1
1980	260.4	45.6	114.2	36.5
1981	303.3	53.6	128.5	48.2
1982	391.1	78.3	177.9	63.8
1983	354.3	78.8	164.0	59.0
1984	319.0	73.6	159.6	61.4
1985	327.4	63.0	189.0	50.4
1986	295.7	71.0	183.2	41.1
1987	282.5	79.0	169.3	33.7
1988	281.6	69.0	154.1	26.6
1989	298.6	132.3	114.9	28.5
1990	244.8	141.4	51.0	28.1
1991	306.3	121.6	34.1	24.1
1992	260.4	100.2	24.0	16.1

Table 7.3 **Capital input cost: terminal (station) sub-system 1951/52 to 1991/92 ($M 1989/90)**

Year ended 30 June	Suburban	Interurban	Country	Interstate
1952	13.4	-	9.7	2.3
1953	13.8	-	10.4	2.3
1954	12.6	-	9.4	2.1
1955	14.5	-	10.6	2.7
1956	17.1	-	12.2	3.1
1957	16.9	-	12.2	2.9
1958	16.2	-	11.4	3.0
1959	14.7	1.4	10.5	3.4
1960	15.4	2.2	9.8	4.1
1961	15.0	2.8	10.1	2.7
1962	15.8	2.2	9.8	3.7
1963	14.4	2.0	9.4	3.4
1964	14.4	2.4	9.7	2.9
1965	15.4	2.1	10.0	3.0
1966	15.4	2.3	10.3	3.5
1967	14.9	2.2	10.3	3.1
1968	14.4	2.1	10.1	3.4
1969	16.7	2.9	12.1	3.9
1970	20.7	3.1	15.4	4.8
1971	21.4	3.7	16.3	5.1
1972	20.0	3.4	15.0	4.2
1973	25.4	4.1	16.8	4.4
1974	31.5	6.1	24.7	6.1
1975	30.8	5.6	21.3	5.2
1976	35.2	6.4	16.1	6.3
1977	37.9	6.7	16.0	5.9
1978	35.8	6.3	15.1	5.7
1979	38.8	7.0	17.3	6.2
1980	48.3	8.5	21.2	6.6
1981	57.5	10.2	24.2	9.1
1982	74.3	14.8	33.8	12.2
1983	68.3	15.2	21.7	11.2
1984	63.6	14.6	31.8	12.4
1985	66.1	12.8	38.3	10.1
1986	60.3	14.5	37.4	8.3
1987	58.2	16.3	34.9	7.0
1988	58.6	14.4	32.1	5.5
1989	62.4	27.6	24.0	6.0
1990	72.8	29.8	10.7	6.1
1991	66.2	26.4	7.4	5.4
1992	62.8	24.2	5.8	3.8

Table 7.4 **Capital input cost: B and C administration sub-system 1951/52 to 1991/92 ($M 1989/90)**

Year ended 30 June	Suburban	Interurban	Country	Interstate
1952	8.6	-	6.2	1.6
1953	7.2	-	5.4	1.3
1954	8.7	-	6.5	1.5
1955	8.2	-	6.0	1.7
1956	9.0	-	6.5	1.6
1957	8.3	-	6.1	1.4
1958	8.4	-	5.9	1.5
1959	8.0	0.7	5.7	1.9
1960	6.9	1.1	4.3	1.7
1961	8.1	1.4	5.5	1.6
1962	7.6	1.0	4.7	1.8
1963	7.3	1.0	4.8	1.7
1964	8.2	1.4	5.5	1.6
1965	9.7	1.3	6.3	1.9
1966	9.4	1.4	6.3	2.1
1967	9.2	1.3	6.3	1.9
1968	9.1	1.3	6.4	2.1
1969	9.6	1.7	7.0	2.2
1970	11.9	1.7	8.7	2.8
1971	12.2	2.1	9.3	2.9
1972	11.4	2.0	8.5	2.5
1973	14.5	2.3	9.5	2.6
1974	17.9	3.5	14.0	3.5
1975	17.5	3.2	12.2	2.9
1976	20.0	3.6	9.2	3.6
1977	21.6	3.8	9.1	3.5
1978	20.6	3.7	8.7	3.1
1979	22.3	4.1	10.0	3.5
1980	27.8	4.9	12.2	3.8
1981	33.2	5.8	14.0	5.2
1982	42.7	8.5	19.5	7.1
1983	39.3	8.8	18.2	6.5
1984	36.6	8.4	18.3	7.2
1985	38.1	7.3	22.0	5.9
1986	34.6	8.4	21.3	4.8
1987	33.4	9.4	20.0	3.9
1988	33.6	8.3	18.4	3.0
1989	35.7	15.8	13.7	3.4
1990	41.5	17.0	6.1	3.4
1991	37.9	15.2	6.0	2.9
1992	34.6	13.3	3.2	2.1

CHAPTER EIGHT

Total Factor Productivity Results

8.1 INTRODUCTION

This Chapter presents the results of a non-parametric, index number analysis of the Gross Total Factor Productivity (GTFP) of NSW Rail Passenger Services, by market segment, from 1951/52 to 1991/92. It is the culmination of the work contained in the previous Chapters; in particular Chapter 7, which established a wide range of Partial Productivity Indicators from which a set of hypotheses was drawn. The GTFP analysis contained in this Chapter becomes another sub-set of analytical data in the Performance Assessment Portfolio for NSW Rail Passenger Services, from 1951/52 to 1991/92, including:

- Partial Productivity Indicators (PPIs),
- Analysis of technological change and effectiveness as innovation, and
- Analysis of management change and its effectiveness.

It needs to be noted that the index number approach to TFP analysis does have the following inherent limitations, which have been ameliorated in this study.

1. Revenue shares

In the standard GTFP model, revenue shares may be used to dissect output into segments. For example, where total railway output needs to be dissected into its passenger and freight components, the revenue share of each is used to undertake the dissection. This can lead to significant bias because of the Community Service Obligations component contained in passenger output. This problem has been obviated in this study because each of the four market segments of NSW passenger services has been disaggregated using published and archival data.

2. Traffic densities

In the standard GTFP model, some aspects of the operating environment in each disaggregated component may cause TFP to be higher or lower. In particular, this relates to situations where traffic task densities differ markedly. This is the case in the standard GTFP model, between passenger and freight services. But, it is even more pronounced within the market segments of passenger services. For example, between Suburban passenger services (where headways between individual trains are 3 minutes at peak times) and Interstate services where only a handful of trains are operated per day. The real problem is to find a satisfactory measure of traffic densities. In this study, such a measure has been found, with some difficulty namely train kilometres per track kilometre. It is fully explained below.

The data set used in this study uses a time series of 41 yearly observations for four market segments of NSW rail passenger services, plus a total of all the market segments.

The index number approach used in this study is greatly enhanced by the use of 41 years of data. Time series models of this length provide ample data in which to study the behaviour of disturbance terms (Kmenta 1986).

We are examining four market segments serviced by one business firm. In the analysis of variations in Gross Total Factor Productivity, we model two clearly identifiable sources of variation, i.e. management quality and technological change. It has been amply demonstrated in Chapters 5 and 6, that the passage of time is an important factor in the implementation of management decisions and technological change. It is particularly so with a firm which is subject to political and other non-economic restraints. It is, therefore, necessary to choose a model in which time and relationships of variables through time are explicitly recognised.

The management variables are handled in two ways. First, some terms of office of chief executives are combined, to reflect the fact that some chief executives continued policies which were formulated and set in train by their predecessors. Second, a finite distributed lag model is implemented (Greene 1990), where the lag length is known. Alternative lags are also investigated.

The technology change variables are handled in two ways. The major technological changes studied had two distinct characteristics (see Chapter 5):

1. A very limited impact on Gross Total Factor Productivity of the market segments in which they were introduced.
2. The lags involved in their implementation were very long. For example dieselisation (15 years), double-decked suburban trains (28 years), interurban trains (more than 22 years) and the XPT (10 years). In the case of the Eastern Suburbs Railway, it took over 90 years to complete, but its impact on productivity is not felt until its opening after which there is a lag which approximately coincides with its "settling in" period.

The appropriate lags for Management and Technology can be established reasonably accurately with a priori information presented in Chapter 5 and 6. This obviates the penalties imposed by misspecification of lag length (Greene 1990). A polynomial distributed lag model is selected. The principal advantage of this model is that where time lags are long, multicollinearity presents itself as a major problem. The polynomial distributed lag (PDL) model (sometimes known as the Almon Lag Model), imposes a structure upon the lags which reduces the number of parameters in the model. It is based on the fundamental assumption that the distribution of lag coefficients can be approximated by a low order polynomial (Greene 1990).

The rest of this Chapter is organised as follows. First GTFP is discussed in relation to the principles of the measurement of the performance of firms. Second, the results of the GTFP and its components are presented. Third, comments are made regarding the variations in TFP and finally some conclusions are drawn.

8.2 GTFP OF NSW RAIL PASSENGER SERVICES AND THE PRINCIPLES OF PERFORMANCE MEASUREMENT

In Chapter 1, it was noted that the overwhelming issue for Australian industry and economic management in the 1990s is one of economic survival through the achievement of acceptable levels of efficiency of firms in both the public and private sectors, which will lead to export growth and sustainable economic development.

At a Government level, a considerable number of reports discuss the performance of Government Business Enterprises. The Industry Commission's report on TFP Case Studies (IC 1992) sought to develop an understanding of economic efficiency by using two methods in their Performance Assessment Portfolio namely real rates of return and TFP. In the private sector, econometric methods are not generally used in performance assessment. This seems to be a major omission, especially where firms and industries need to demonstrate their capacities for improving their efficiency.

Chapter 3 established a conceptual framework of the Claire Model, which views the firm as a "system" which facilitates the application of both parametric and non-parametric methods down to the minutest sub-process, permits a "bottom up" approach to TFP measurement and facilitates the use of econometric methods in the implementation of performance improving techniques such as Total Quality Management (TQM). Chapter 4 shows why two output indicators (passenger kilometres and seat kilometres) are used. The reasons for this decision are also summarised below.

Chapters 5 and 6 develop a theme introduced into a previous TFP analysis of Australian railway systems (Hensher et al. 1995) namely the importance of management and technology change as sources of variation in TFP. However, a very strict definition is applied to technological change, i.e. it must be seen as an innovation or, that process which creates a new production function within a firm, which leads to a net improvement in the Total Factor Productivity (TFP) of that firm.

Chapter 5 demonstrates with the use of PPIs that even major technological changes had only marginal impacts on productivity, and then only on individual sub-systems such as train running but not upon the firm as a whole. Similarly, a strict definition is applied to management. In the context of NSW rail passenger services, management is defined as "failure management" where strategic decisions and actions by decision makers in government, industry or the firm are taken to ameliorate the adverse consequences of a long term technological or market failure. Nevertheless, within these strictures, some sources of variation are clearly discerned, arising from the different focuses and philosophies of the management eras.

In the final analysis this TFP study must meet the essential criteria of good performance measurement (Hensher et al. 1995):

1. To set out, simply, why TFP is useful as a performance indicator for measuring cost efficiency in railways or any other industry or firm, and how this may be related to other measures of the efficiency and effectiveness of the firm.
2. To establish the paradigm for data requirements for a study of this nature, in particular establishing a methodology for disaggregation to the level of individual processes. This enables the use of TFP measures as a practical tool for such techniques as total quality management.
3. To quantify TFP of NSW rail passenger services, by market segment.
4. To relate the overall index of performance to the large number of partial productivity indexes considered in Chapter 7 above, and to any contextual/operational factors, where these are considered relevant. The most useful one seems to be track density, as measured by train kilometres per track kilometre. This fourth criterion of good performance measurement then enables a consideration of strategic options which may be open to management to implement changes which will lead to improved overall productivity.

8.2.1 The Output Data Used to Measure TFP

In keeping with the Australian Railways Study (Hensher et al. 1995), both a "supply side" index and a "demand side" index is used. This is considered to be a much more comprehensive way of reflecting output, and highlights the issue of excess capacity in the off-peak periods, which was raised in Chapter 7 above. The supply side index, Seat

Kilometres, is an intermediate output in that it represents seats offered for travel. As a rule of thumb, the differences between seat kilometres offered for travel and the passenger kilometres actually travelled is a measure of the level of excess capacity.

It will be recalled from Chapter 4 that the only meaningful supply side indicator was seat kilometres, and a full account of its calculation and meaning was given in that Chapter. In the case of demand side indicators, three were considered—revenue (including revenue per journey), passenger journeys, and passenger kilometres. Revenue was rejected on the grounds that it contained a component paid by the Government to cover unremunerative journeys, i.e. a large number of concession fare and free travellers. When this component is included, it is more clearly understood as an economic rent payable to the railways to operate services at a politically acceptable level. Passenger journeys were retained for consideration as an output indicator until some preliminary econometric analysis could be undertaken. In this analysis, Passenger Journeys were regressed within each of the market segments, and a Coefficient of Determination obtained.

A similar analysis was undertaken with passenger kilometres. The coefficients for journeys and passenger kilometres were then compared. The best results, by market segment, were obtained for both Interurban journeys and passenger journeys, with individual coefficients ranging from .716 to as high as .923. This is understandable for Interurban journeys since the market was growing rapidly from a small base. The application of additional labour, capital and other resources needed to be responsive to this increasing demand. This is typical of new and rapidly growing markets. Suburban market results were much lower, with coefficients ranging from .009 to .659. This reflects the cyclical nature of demand, the non-responsiveness of labour supply to these demand fluctuations and the fact that capital spending is driven as much by political considerations as by dictates of the market. Not surprisingly, the highest coefficients were fuel consumption and cost. Passenger kilometres' coefficients were only marginally better than those of passenger journeys. The coefficients for the Country market were relatively low and included three which were negative. However, labour numbers and costs were robust, both for journeys and passenger kilometres. This reflects the fact that successive managements did respond to the long term decline in Country passenger demand by reducing labour numbers and cost. Overall, the coefficients for journeys were higher than for passenger kilometres.

A similar situation was revealed for the Interstate market, although the coefficients for labour were lower. Also, of the twelve coefficients, eight were negative. This probably reflects the fact that, in the face of mounting evidence of declining demand, there was a minimal adjustment in supply, for political reasons. As with the Country market the coefficients were more robust for journeys than passenger kilometres. On balance, passenger kilometres were selected for all market segments because they were strongest in the two main markets, Suburban and Interurban. A further factor in favour of passenger kilometres, as noted in Chapter 4, is that it is generally regarded as a more powerful indicator, as it incorporates the dimension of distance travelled.

8.2.2 The Input Data Used to Measure TFP

In keeping with the Australian Railways Study (Hensher et al. 1995), the inputs include labour numbers and cost, fuel quantity (megajoules) and cost and capital cost and materials cost.

Labour and capital are the most important inputs in measuring railway TFP. Whilst all the issues relating to railway labour were covered in Chapter 4 above, they are worthwhile summarising below.

1. Labour is hired to fill a position. This is a major factor in explaining the relative "stickiness" of changes in labour numbers. It also explains the relatively high overhead component in labour costs such as superannuation, leave entitlements, industry allowances, etc.
2. Contributing to the high overhead component in labour cost is the view that service in the railways was traditionally regarded as a lifetime career.
3. The widespread and active unionisation of the industry which preserved the culture in (2) and the positions in (1).
4. The labour factor of production needs to be regarded as "human capital" rather than as a unit of input which can be bought, consumed and dispensed with as output rises and falls.

The calculation and verification of labour numbers and cost is explained in detail in Appendix 2. The data used in the calculation of TFP represents labour used in four sub-systems of passenger operations, i.e. train running labour, corridor labour (track and infrastructure maintenance), terminal and station labour and business and corporate overheads labour.

The next major input is Capital, which is again considered at length in Chapter 4 and Appendix 2. There are some special historical factors which have influenced the costs of capital formation in NSW Railways since 1951/52:

- The Railways entered 1951/52 with infrastructure and rollingstock which was old and worn down by heavy use in World War II.

- Between 1951/52 and 1991/92, the Railways spent some $7 billion (in current dollars) on capital formation. The bulk of this was spent during the high interest rate regimes of the 1970s and 1980s.
- Much of this capital formation was undertaken on political criteria rather than economic criteria and would be difficult to justify in benefit/cost terms. In a study of major investment projects completed by NSW Railways between 1971/72 and 1986/87, the following situation applied (De Mellow 1988):

	Benefit/cost ratio less than 1.0 ($million current)	**Benefit/cost ratio greater than 1.0** ($million current)
Eastern Suburbs Railway	$168 m	
East Hills line		$83 m
Sydney/Newcastle Electrification		$113 m
80 Interurban cars	$118 m	
450 Tangara cars	$450 m	
14 HP trains	$90 m	
First 4 XPT trains	$39 m	

- To a significant extent, and then only when safety issues intervened, fundamental infrastructure such as permanent way, bridgework etc. was found to be the least endowed in terms of capital. When capital was spent, the upgradings were generally done within the constraints of existing alignments, gradients etc. These were established in the 19th Century.
- Large land holdings are also a major feature of railway operations in NSW. It was necessary to value this land at market prices as part of the calculation of the cost of capital.

It is important to identify fuel consumption and costs as an input to TFP. During the study period, the railways passed out of the steam era into diesel traction and a greater use of electricity. To reduce these different energy sources to a common measure, the "joule" is used.

Finally, materials costs are separately identified, as an input to TFP. Whilst some studies of TFP of other industries insist on the separate identification of each type of material, this would be a major task for a railway system. For example, in NSW there are over 5,000 items which might receive a separate listing. Nevertheless, the requirements for dissection are partially satisfied in this thesis by separately listing Materials Cost for each sub-system, i.e. locomotive maintenance, carriage maintenance, variable track maintenance, corridor maintenance, terminals (stations) maintenance and business and corporate overheads materials cost.

8.3 THE OVERARCHING AND WORKING HYPOTHESES TO BE TESTED

8.3.1 Working Hypotheses

From Chapter 7, we have developed four Working Hypotheses on each of the Inputs, for each market segment and the passenger market as a whole.

Labour productivity

A strong and sustained growth in demand for rail passenger services is a necessary requirement for a strong and sustained improvement in all passenger railway labour productivity. However, a number of past strategies (e.g. excess capacity, especially in the off-peaks) have created conditions where even strong and sustained growth in demand is not sufficient to improve productivity, and a more radical restructuring of labour and service output is suggested.

Capital productivity

A strong and sustained growth in demand for rail passenger services is a necessary requirement for improvement in passenger rail capital productivity. Very substantial investment in fleet modernisation led to a very substantial increase in the cost of capital per unit of output, which outweighed productivity gains from materials and other costs. Modest investment in corridor infrastructure meant that a mismatch now exists between high performance rollingstock and 19th Century corridor infrastructure, which if upgraded may not yield sufficient benefits to cover the cost of upgrading.

Fuel productivity

The introduction of new rollingstock with more powerful motors and engines has led to an increase in fuel consumption per unit of output. A necessary condition for the optimisation of fuel consumption is an increase in ridership and some further attention to fuel conservation methods.

Materials and other cost productivity

Whilst fleet modernisation has had a significant impact on materials and other cost productivity, this has happened less in the terminals and stations sub-system and very much less so in the corridor sub-system. In these latter sub-systems, large scale innovation is needed in the type of materials used (especially in their quality), maintenance methods etc. In the case of the Business and Corporate Administration sub-system, the low level of productivity in the usage of materials and other costs is a second order consequence of the accretion of bureaucracy resulting from successive reorganisations of the NSW Railways.

8.3.2 Overarching Hypotheses

In addition to the four Working Hypotheses, there are four "Overarching Hypotheses". They are termed "Overarching" because they endeavour to explain, inductively, the operation of the firm, looked at holistically. They centre around another introduced concept namely that of "failure", where the expected or normal conditions of economic rationality do not necessarily apply and, where the managers of the firm do not observe the economic rationalities found in the management of normal firms, which are operating profitably in competitive markets as usually defined in economics. It is within the following holistic "umbrella" of hypotheses that the working hypotheses are set up.

Overarching Hypothesis I relates to the management of failure, i.e. continuous strategic decisions and actions by decision makers to ameliorate the adverse consequences of one or more of such failures as market failure, institutional failure, technological failure, management failure and other failures. The hypothesis goes on to state that failure management will continue until the originating failures are corrected, and that there are as many models of failure management as there are industries and business cultures.

Overarching Hypothesis II deals with the process of innovation in a failure management culture i.e. any innovation in such a regime is doomed to fall well short of its potential to improve the TFP of the firm as a whole.

Overarching Hypothesis III is that market failure occurs when average revenues are determined by the political process.

Overarching Hypothesis IV states that the originating market failure is reinforced by the absence of any functional relationship between the output of passenger train services and revenue earned from "unremunerative" passenger journeys.

8.4 GTFP AND ITS COMPONENTS

The formulation originally developed by Caves et al. (1982) and adapted for the Australian Railways study by Hensher et al. (1995) is also used for this study. The formulation enables comparison between market segments which are independent of the market or the year chosen, so that the index becomes a useful tool in the benchmarking process.

GTFP performance by market segment is shown in Figures 8.1 and 8.2. It will also be seen that two GTFPs are calculated, one showing final demand (TFPd) based on passenger kilometres and the other showing intermediate demand (TFPs) based on seat kilometres.

$$\mathrm{Ln}\left[\frac{\mathrm{TFP}_k}{\mathrm{TFP}_b}\right] = \begin{array}{l} -\frac{1}{2}\Sigma i\left(\ln Yki - \overline{\ln Yi}\right) \\ -\frac{1}{2}\Sigma i\left(\ln Ybi - \overline{\ln Yi}\right) \\ -\frac{1}{2}\Sigma n\left(\ln Xkn - \overline{\ln Xn}\right) \\ +\frac{1}{2}\Sigma n\left(\ln Xbn - \overline{\ln Xn}\right) \end{array}$$

where

k	=	each individual observation, k = 1, ..., K			
b	=	base observation (average of all observations)			
i	=	outputs, i = 1, ..., I			
n	=	inputs, n = 1, N			
ln Yi	=	unit measure of output,	$\overline{\ln Yi}$	=	geometric mean of unit measure
ln Xn	=	unit measure of input,	$\overline{\ln Xn}$	=	geometric mean of unit measure

This formula does not contain identities covering revenue shares of total outputs since costs were developed independently for each market segment.

8.4.1 Overall Trends and Cycles

A close examination of Figures 8.1 and 8.2 shows some interesting patterns of change amongst all the market segments. In terms of analysis of variations in TFP, it most clearly reflects change in the management eras of Railways' chief executives. TFP may be seen as a clear index of a "failed" system, correctly diagnosed as such by Commissioner Shirley as having:

- too much railway track,
- too many stations open for business, but losing substantial sums of money,
- antiquated rollingstock and infrastructure,
- a Branch system of organisation with promotion by seniority, where each Branch was a self-perpetuating and semi-independent identity,
- lack of modern management practices, and

- a highly centralised, unwieldy and time consuming decision-making process, which was supported by an administration system, where paperwork had become an end in itself, but where hard data for management (such as costs) was not available.

The trends and cycles in TFP may be viewed as reflecting management's attempts to deal with this failed system. In Chapter 6, a detailed chronicle is presented of the different management eras. In this section, we extract from that chronicle the key decisions and actions which explain the turning points in the TFP trends and cycles, the attempts at corrective measures when downturns occurred in the TFP cycle and the missed opportunities to sustain upturns in the TFP cycle. Underlying everything is a fundamental truth that non-existent, badly flawed or misinterpreted information was a core problem in the failure management of NSW rail passenger services. To facilitate an understanding of the nexus between the management eras and TFP, constant references are made back to Chapter 6.

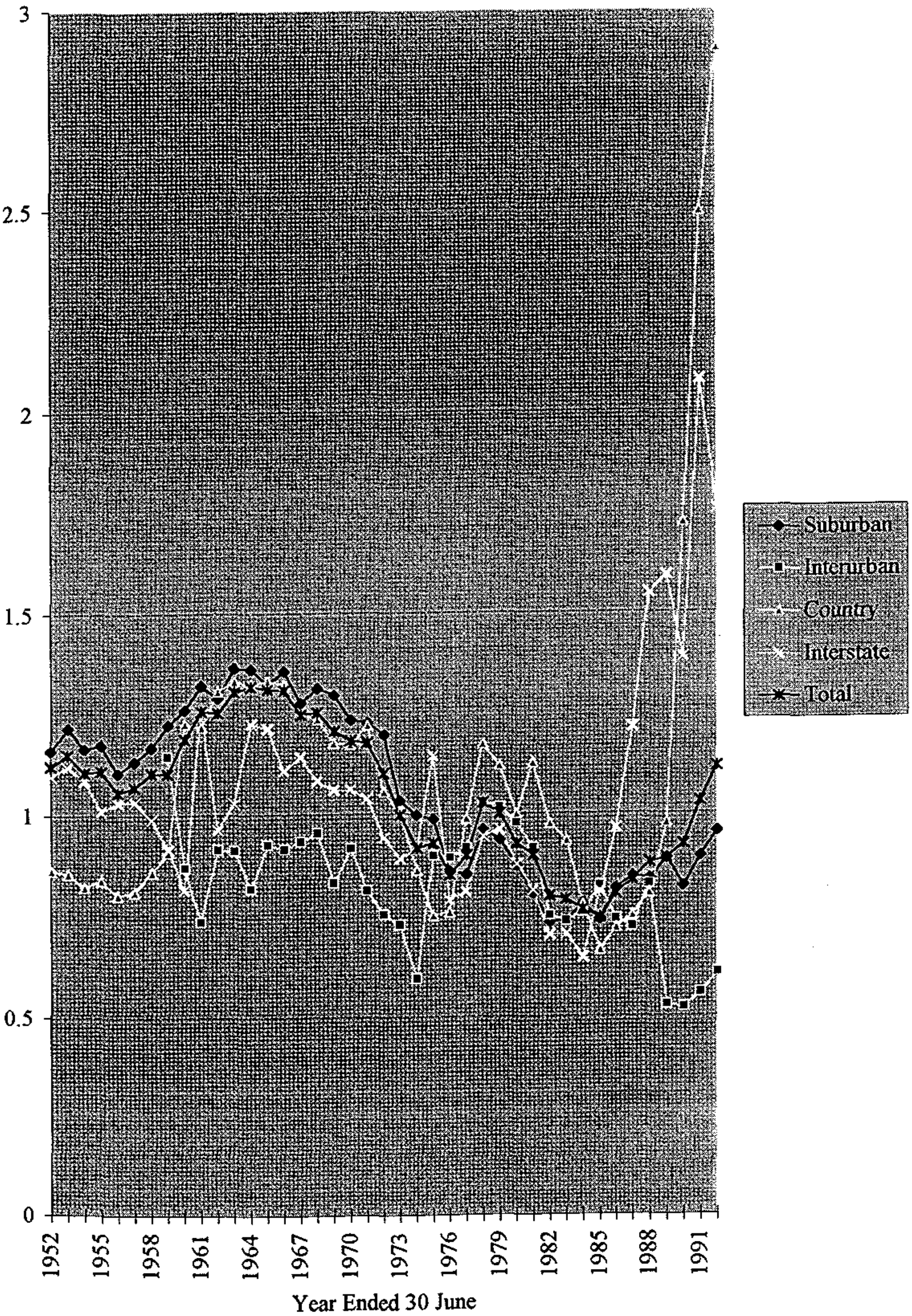

Figure 8.1 GFTPd, measured in passenger kilometres

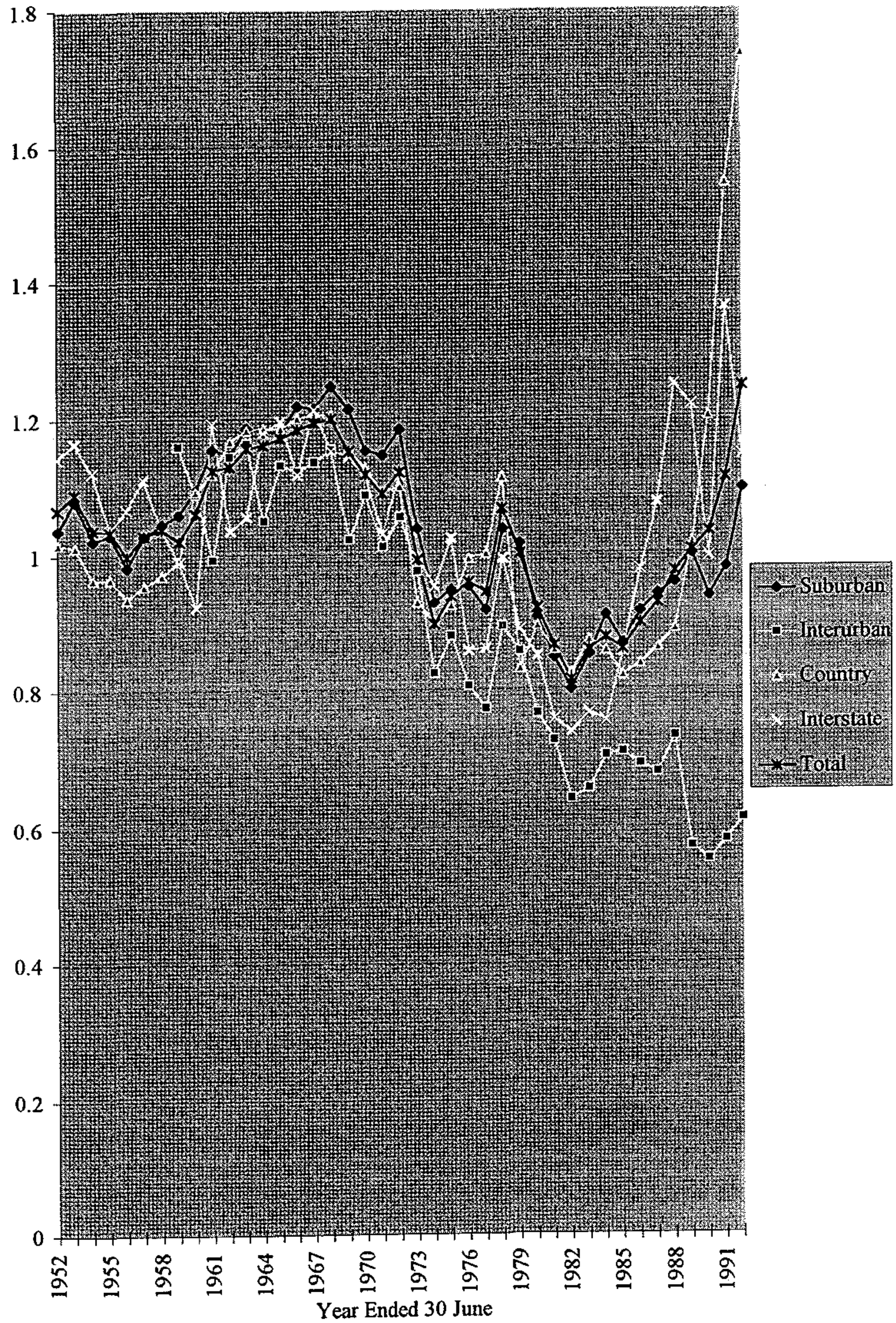

Figure 8.2 GTFPs, measured in seat kilometres

The Winsor era (1951/52–1955/56)

Winsor was able to keep TFP above 1.0 during his tenure, despite continuing crises and systemic failures. Winsor achieved this by:

- Increasing patronage by some 13 million journeys per year between 1952/53 and 1954/55. This was achieved by adding some 1200 new passenger train services, which used up hitherto idle assets.
- Transferring peripheral, high-cost and difficult to manage capital assets—four power stations—off the Railways' books to the Electricity Commission of NSW.
- The capital works budget was severely reduced because of a shortage of State funds.
- Labour costs were kept down largely because the labour was simply not available.

By July 1956, TFP is shown as at or close to the benchmark 1.0. The benchmark is the mean for all of the years 1951/52 to 1991/92, for all segments and the total. As an approximation only, it is possible to apply a base year to the benchmark value. The approximate base year may be taken as 1951/52 where GTFP values were slightly above 1.0 in nearly all cases. The overall railway deficit had reached 7.6 million Pounds on a total revenue of 76 million Pounds. Without any real understanding of likely market response, the Government attempted to eliminate this deficit by increasing metropolitan fares by 30 per cent and country fares by 15 per cent. Winsor's subsequent resignation partly reflected the political turmoil wherein the Transport portfolio had changed hands six times since 1949.

The McCusker era (1956/57–1971/72)

Throughout his tenure, McCusker kept TFP above the benchmark 1.0. During his tenure, TFPd peaked at just above 1.3 between 1962/63 and 1965/66. TFPs peaked at 1.2 in 1967/68. TFP went into steep decline at the end of his era.

Despite the fact that all the systemic failures existed during his tenure including some failures which became worse, he proved to be the most adroit and effective failure manager in the period 1951/52 to 1991/92. His era is covered at some length in Chapter 6 above, but there needs to be a focus on those decisions and actions which had a clear impact on TFP.

The graphs show that TFP remained relatively close to the benchmark 1.0, from 1956/57 to 1959/60. These were years of struggle by McCusker to effect a financial turnaround. As a result of the fare increases in July 1956, patronage declined by 11 million journeys to 1959. Deficits continued to build and annual capital charges represented 5 per cent of total Railway capitalisation.

The graphs show that from 1959/60 to 1965/66, TFPd rose to its highest level, at just over 1.3. TFPs grew to 1.2 in 1967/68. These levels were not achieved again until 1991/92. McCusker was able to achieve this with the following actions:

1. He followed a policy of confining capital spending on assets which would increase revenue or reduce costs (except the ESR). In real terms, annual capital costs were held below $300 million.
2. Staff ceilings were imposed, and staff numbers fell as follows:

Segment	Staff Numbers	
	1959/60	1967/68
Suburban	10279	9312
Interurban	1497	1357
Country	7258	6413
Interstate	3579	2634
Total	22613	19716

3. However, in this period, patronage began a slow decline due to many factors including the emerging suburban "sprawl", increased motor car usage, work place relocations and a major recession in 1961/62. Some crude research enabled McCusker to attempt some basic countermeasures including "demand-based" timetabling of trains, sales promotions, extension of electrified suburban services, commuter express trains to the Blue Mountains and overnight services between Melbourne and Sydney. At least, this slowed the decline in demand.

The graphs show TFP going into decline from 1967/68 to 1971/72, as McCusker's ability to manage the systemic failures began to decline.

A major institutional failure was the Government's decision to recommence the "white elephant" of the Eastern Suburbs Railway. It was to eat up a large proportion of scarce capital and, in the end, added only 14 million journeys a year. Capital input costs rose from $278 million in 1967/68 to $363 million in 1971/72, in real terms. Nevertheless, it was becoming clear that McCusker was presiding over a technologically failing railway, which was well past its economic and technical lifespans.

Organisationally McCusker presided over a system which could not compete in a buoyant labour market for labour of any grade or quality. Stringent controls on costs imposed by McCusker meant that pay and working conditions relativities went into decline. In late 1968 and early 1969, McCusker's personal accord with Unions, established earlier in his career as chief executive, collapsed in a campaign of rolling strikes. Despite increases in some awards, industrial unrest continued in 1971/72. With considerable effort, McCusker held down the rate of growth in real labour costs, as follows:

Market Segment	**Labour Costs ($M 1989/90)**	
	1967/68	1971/72
Suburban	195	220
Interurban	29	37
Interstate	47	50
Country	159	183
Total	430	490

The impact of the organisational failure was most clearly apparent in the Country passenger system, where real labour costs had risen by 15 per cent. The subjection of productivity issues to a policy aimed at improved financial performance resulted in the massive fare increases (around 50%) imposed in 1971/72, in an attempt to reduce the transport deficit which was temporarily successful. In that year, average revenue per passenger increased by 52.6% for Suburban journeys, 53.8% for Interurban journeys, 46.2% for Country journeys and 43.3% for Interstate journeys. Between 1969/70 and 1972/73, Suburban passenger kilometres dropped by 12.3%, Country dropped by 13.4% and Interstate dropped by 32.9%.

The Shirley/Trimmer eras (1972/73–1975/76)

The graphs show that TFP went into a steep decline from 1972/73 to 1975/76. This was the era of Messers. Shirley and Trimmer, and the Public Transport Commission of NSW. Despite his correct diagnosis of the railway problem, Shirley was unable to remedy it because of the systemic failures which, in some cases, were made worse by the Government's, or his own decisions.

The organisational failure of the Railways was exacerbated by its amalgamation with buses and ferries. This led to the creation of a huge administrative overburden which was to lay the foundation for large overhead costs in later years.

Institutional failure emerged with a significant "railway rehabilitator" policy faction built around Dr Robert Nielsen and his Sydney Area Transport Study. This faction commenced work in 1971 and in 1974, recommended a $6,000 million capital works program to build 1,200 kilometres of roads and freeways, new railway lines, and purchase 4,000 new buses.

The Minister for Transport, one day later, produced a plan to cut 10,000 jobs by natural attrition, and replace country branch line services with air conditioned coaches. The

Federal Government stepped in with a compromise called the Urban Public Transport Improvement Program (UPTIP): to spend $300 million on modernising urban public transport. But high public profile projects were favoured over more fundamental problems such as track renewal. UPTIP did not survive after the election of the Fraser Government in 1976 and NSW was left to fund some UPTIP projects including its own capital works (which still included the increasingly costly ESR). The impact on capital input costs was very significant, as follows:

	Total passenger capital input cost	
	($M 1989/90)	% change
1971/72	363.4	
1972/73	427.2	17.6
1973/74	574.4	34.5
1974/75	529.2	- 7.9
1975/76	536.9	1.5

On the organisational front, also, the Government and Commissioner Shirley completely lost control of the industrial situation. In fact, in many parts of the organisation, management had ceased to manage the employees under their control for fear of creating an industrial incident. Labour numbers increased in robust fashion and costs spiralled out of control, thus:

	Labour input cost ($M 1989/90)	
	1971/72	1975/76
Suburban	220	306
Interurban	37	66
Country	183	163*
Interurban	50	61
Total	490	596

Note:

* This indicates that the worst examples of over-staffing etc. were contained, but not as much as was needed.

To address market failure, a Passenger Marketing Section was established in the Commission. It only had a very crude understanding of the very complex market it was facing. Rail patronage continued to decline without anyone really understanding why. In May 1975, a new urban passenger timetable was implemented and failed spectacularly as described in Chapter 6.

In May 1976, a new government under Premier Wran was swept into power on a platform of reform of public transport. All of the problems originally identified by Shirley were still present, some were worse and a new one had emerged—unsafe tracks and bridges.

The Reiher/Hill eras (1976/77–1985/6)

Under a new Commissioner, Alan Reiher, TFP rose again, passing the benchmark 1.0 in 1977/78, albeit briefly. A brake was placed on capital spending, as follows:

	Total passenger capital input cost ($M 1989/90)
1975/76	537
1976/77	555
1977/78	530

The disastrous Granville accident on 18 January 1977 was the trigger for removing this brake. Thereafter a serious attempt was made to contain labour input costs. Labour numbers were reduced and labour costs moved as follows:

	Labour input cost ($M 1989/90)	
	1976/77	1977/78
Suburban	336	343
Interurban	69	71
Country	162	170
Interstate	59	61
Total	626	645

The previous failures in industrial relations were addressed by establishing a Joint Council with the Unions, but there was some way yet to go. Market failure was exacerbated by a 20 per cent cut in fares commencing July 1976. It was a populist political decision undertaken with no research and had no effect on patronage which stabilised in urban markets but continued to fall in non-urban markets (Hensher and Bullock 1979).

The graphs show that TFP went into another steep decline after 1977/78. Measured as TFPs, this decline reached its lowest trough in the study period in 1981/82. Measured as TFPd the lowest trough was not reached until 1984/85. Failure management remained but took on a new form and shape. Without really understanding the nature and significance of the underlying market failure it was facing, the Government embarked on a very substantial investment program, concentrated in new rollingstock acquisition and the completion of the ESR (which was now unavoidable). The rollingstock investment program opted for double decked carriages and replaced old stock on a one-for-one basis virtually doubling capacity. Absorption of surplus capacity in the off-peaks has never been seriously addressed, as a marketing problem, to this day.

These decisions led to a serious blow-out in capital input costs as follows:

	Total passenger capital input cost ($M 1989/90)
1977/78	530
1978/79	583
1979/80	711
1980/81	840
1981/82	1121
1982/83	1065
1983/84	1011
1984/85	1048

The problem was that these new capital assets, although technically brilliant, were not innovative, as defined in Chapter 5, i.e. they only had a marginal influence on TFP. Organisational failure was not tackled until the advent of David Hill, and the dismemberment of the Public Transport Commission. In the last two years of that organisation, there had been 496 industrial disputes, and a now chronic paralysis of management. But it was not until January 1985, after a series of bruising confrontations between Hill and some railway unions, which had started in 1982, that a new platform could be built for a turnaround in TFP. In 1984, the key Traffic Branch in the railways ended its life after 129 years. Two business units were created, one for freight and one for passengers. Each unit was responsible for all aspects of services. Finally, a new Minister was appointed in April 1984. Renewed attempts were made to control labour costs as follows:

	Labour input cost ($M 1989/90)				
	Suburban	Interurban	Country	Interstate	Total
1977/78	343	71	170	61	645
1978/79	325	69	171	58	623
1978/80	323	61	183	54	626
1980/81	329	69	169	59	626
1981/82	317	72	168	58	615
1982/83	306	76	166	55	603
1983/84	296	77	174	61	608
1984/85	298	70	204	49	621

The underlying market failure remained. Only primitive attempts were made to understand the complex dynamics of passenger markets and even when these attempts provided clear evidence of trends, the results were ignored or misunderstood. The waters were further muddied by advice given to the Government from re-runs of transport models based on the relatively discredited SATS Study of 1971.

	Passenger kilometres (million)				
	Suburban	Interurban	Country	Interstate	Total
1977/78	3097	415	1101	409	5022
1978/79	3056	439	1147	426	5069
1979/80	3501	491	1242	398	5632
1980/81	3544	522	1660	474	6201
1981/82	3700	553	1621	444	6318
1982/83	3455	604	1420	398	5876
1983/84	3400	607	1093	291	5491
1984/85	3366	609	1043	408	5426

The Johnson era (1986/87–1987/88)

The recovery in TFP commenced in 1985/86 and continued to 1991/92. The recovery coincides with the resignation of Hill and the appointment of Pat Johnson in November 1986. But Hill had set the platform for recovery and Johnson, as the second Change Agent, continued to build on it. Johnson gave the TFP recovery process two solid years of growth until the demise of the Labor Government in March 1988.

1. Organisational failure was minimised, and a new rationality was emerging in the Government's decision making regarding fiscal responsibility. Industrial disputes were negligible and staff numbers began to decline. Capital input costs declined from $1048 million in 1984/85 to $916 million in 1987/88. Future capital works programs were now being evaluated, and a corporate plan clearly showed the direction in which the Railways needed to go about the task of reduction in staff numbers following a gradualist and humane approach. A blow-out had occurred in Business and Corporate Administration labour costs. This overhead cost structure had been building up for many years. As new professional staff were needed, they were hired but the traditional administrative functions remained. This is illustrated in the following:

	Total labour input cost ($M 1989/90)		
	Total cost	B & C Admin cost	Admin % of Total
1984/85	621	139	22.4
1985/86	602	142	23.6
1986/87	603	162	26.9
1987/88	675	217	32.1

2. The underlying market failure remained, and also remained misunderstood. A detailed study was undertaken of the Suburban and Interurban markets for rail services but suffered from a number of failings. It failed to seek information about non-users of the rail services and it emphasised the processing of numbers instead of identifying causes of patronage changes. Urban patronage was growing strongly, while non-urban patronage declined.

3. Most of the underlying problems originally identified by Philip Shirley in 1972 still remained, with the added humiliation that State Rail was technically bankrupt—liabilities reportedly exceeding assets by $500 million.

The Sayers era (1988/89–1991/92)

The Greiner Government and the new Chief Executive, Ross Sayers, employed the now tried and tested method of hiring external experts to diagnose State Rail's well known problems. This was undertaken by a Commission of Audit and two management consulting firms.

The graphs show that TFP continued to rise steeply, passing the benchmark 1.0 in 1990 and 1991. Sayers tackled State Rail as an Appointed Receiver would tackle a bankrupt private business, with the strong backing of the Government.

1. The organisational failure was tackled by breaking up State Rail train services into business groups: Freight Rail, Countrylink for Country and Interstate passenger services, and Cityrail for Suburban and Interurban passenger services. Flat management structures were introduced and downsizing commenced. Whole Branches in the corporate administration were abolished. Good superannuation and redundancy payments permitted many employees to leave the organisation. In 1985/86 staff numbers were 41,071. In 1991/92 numbers were down to 24,467—a decline of 40%. Industrial relations remained relatively good. The aftermath of the downsizing was a great deal of confusion and low morale amongst remaining employees. The social cost of this has yet to be determined. The total demolition of the old branch structure meant that all kinds of improved management practices could be introduced. Some, like Total Quality Management, were tried, but abandoned. The new, relatively young, senior managers were still building their own self-confidence, and feared making mistakes with new ideas.
2. In October 1988, the long standing problem of Country branch-line train services was resolved by deregulation and handover to road coach operators. The deficit in country passenger services declined from $155 million in 1985/86 to $72 million in 1991/92.
3. The incipient problem of technological failure (often an aftermath of rapid change) was handled by setting up a Rail Safety Audit Bureau. It proved very effective. Investment continued in new rollingstock and signalling systems, but even so, capital input costs were declining by 1991 and 1992, as follows:

	Capital input cost ($M 1989/90)
1987/88	916
1988/89	976
1989/90	951
1990/91	822
1991/92	702

4. Market failure may still be deemed to exist, as concluded in Chapter 6.

When the overall trends and cycles in TFP are examined in relation to the management decisions and actions taken at the time, it becomes very clear that management quality is the critical force in changing TFP for the better or worse. Because railway passengers are a service industry, there is no distribution chain to slow down the impact of a decision as with primary or secondary production. In some cases, the imprint of a single chief executive has been very clear, as with McCusker. The sharp decline in TFP which started with Philip Shirley did not finish until the end of David Hill's tenure. But it was during this tenure that the foundation was laid for the ultimate recovery of TFP.

8.4.2 The Best and Worst Performers

It will be seen from the above that whilst failure management and lack of innovation has had a universal impact on TFP of all segments, individual segment TFPs have been variable. Until 1983/84, the TFP of *Suburban* services was the highest of all four market segments, staying above 1.0 until 1974/75. It has not risen above this figure since. This is despite the fact that Suburban passenger kilometres increased between 1974/75 and 1991/92 by 50.9 per cent. In 1974/75, the Labour Numbers Index stood at 98, and had fallen to 79, by 1991/92. The Labour Costs Index for the same period, however, increased from 113 in 1974/75 to 127 in 1991/92—a modest increase but reflecting a substantial increase in the unit cost of labour. The Fuel Quantity Index rose from 78 in 1974/75 to 186 in 1991/92, reflecting the phasing in of high performance, high power consuming double decked rolling stock. This also impacted on Fuel Cost. The Materials Cost Index was almost static between 73 and 80 Index points, reflecting in significant measure, the modest achievements in track maintenance. The Capital Cost Index rose from 89 in 1974/75 to 154 in 1991/92, having peaked at 213 in 1982/83. This reflects the double decked rollingstock investment programme, the Eastern Suburbs Railway construction, station upgrading, etc. None of these decisions may be classified as innovations. The double decked rollingstock programme helped to solve overcrowding in the peak period but has created a major problem of excess capacity, which may be demonstrated by the following statistics:

	1974/75	1991/92
Passenger Kilometres ('000s)	2,847,945	4,142,700
Seat Kilometres ('000s)	6,434,048	12,373,490
Difference Seat Kms and Passenger Kms	+3,586,103	+9,230,790

Source: RAILDATA.

This clearly demonstrates the "hot air/ cold air" syndrome of failure management, i.e. there is a large proportion of suburban rail carriages operating in the system every day, filled only with hot air in the winter and cold air in the summer. Much of this is in the off-peak periods. To eliminate this failure management syndrome, railway management must learn the art of competition with the motor car and generate new demand for its services.

The next best TFP performance, overall, has been *Interstate* services even though these have been subject to cyclical influences and carry a high proportion of "unremunerative" passengers. Because of the fewer number of services, it is a relatively more straightforward problem for management to match resources to demand. The spectacular improvement in TFP since 1983/84 is clear evidence of that.

The third best performance was *Country* passenger services and, more than any other segment, demonstrates the influence of management on TFP variation. The history of TFP Country can be viewed in terms of episodes:

1. Between 1959/60 and 1972/73, Country TFP just exceeded 1.0 and remained at this level. This almost exactly coincided with the McCusker era, from 1959/60 to 1971/72. If ever his particular brand of management seeks a monument, then this is it. The McCusker Model of failure management, as noted in Chapter 7, was characterised by its longevity and relative effectiveness, but ultimately ended in failure because it was selling passenger services in a failed market, and at the same time it was attempting to buy its main resource—skilled and semi-skilled labour—in a highly competitive sellers' market. Nowhere was McCusker able to balance his three constituencies (public lobbies, unions, and Government) more effectively than with Country passenger services.
2. Between 1972/73 and 1984/85, Country TFP shows strong cyclical tendencies thus:

Period	Cycle
1972/73 - 1974/75	Downturn
1974/75 - 1977/78	Upturn
1977/78 - 1980/81	Stability
1980/81 - 1984/85	Downturn

This demonstrates management's struggles to adjust resources to demand. These struggles are illustrated by the following output changes:

	Passenger Kilometres (000's)	Seat Kilometres (000's)
1972/73	1,548,250	2,571,360
1974/75	900,350	2,661,563
1977/78	1,100,995	1,918,440
1980/81	1,660,305	1,863,362
1984/85	1,043,298	3,097,546

Source: RAILDATA.

1984/85 reflects the advent of the XPT. This was a technologically brilliant product which was introduced into a market which was badly misread. The years after 1984/85 show a spectacular growth in TFP, and demand, as services were withdrawn and replaced by road coaches.

The worst performance is the *Interurban* segment. It has never achieved a TFP value of 1.0. This is despite the fact that it was the fastest growing market, based on passengers commuting to workplaces in Sydney. This created heavy demands on investment and also labour numbers and cost. The Interurban market is displaying an off-peak excess capacity problem even worse than the Suburban market:

	1958/59	1991/92
Seat Kilometres ('000s)	557,522	3,828,396
Passenger Kilometres ('000s)	133,084	921,375
Difference Seat Kms and Passenger Kms	+424,438	+2,907,021

This study of NSW rail passenger services has clearly identified management and technology variables as sources of variation in Total Factor Productivity. In this section, we explore further the issues raised above regarding the best and worst performers among the market segments. The sources of these variations are suggested to belong to the variable impacts (or lack of them) of management decisions and technology changes.

8.5 MODELLING THE SOURCES OF VARIATION

A time series analysis with polynomial distributed lag (PDL) was undertaken using LIMDEP, to identify variation in GTFPd and GTFPs within each market segment. Management and technological variables were evaluated, and the final models are summarised in Table 8.1. We consider the management and technology variables in turn. The results are also corrected for heteroscedasticity. This was done principally with the management variables where management eras were combined to allow for the unobserved policy spillovers of management actions from one era to the next which may not have been accounted for by lagging one year.

The five management variables considered as sources of variation are:

MG 1: the Winsor era

MG 2: the McCusker era

MG 3: the Shirley/Trimmer eras

MG 4: the Reiher/Hill eras

MG 5: the Johnson/Sayers eras

A one year lag is applied to all management variables. The specific manner in which these lags worked their way into the performances of succeeding chief executives is discussed below.

The major technology changes had limited impacts and very long lags before implementation was completed. In each case, lagging more than 2 years does not have any significant effect upon the value of coefficients. Consequently a standard 2 year lag is applied to each technology variable to account for the technical "settling in" or development phase of the technology change.

Table 8.1 Explaining productivity variation in NSW rail passenger services by market segment, 1951/52–1991/92

Suburban market segment

Explanatory variables	GTFPd		GTFPs	
	Parameter	(t-stat)	Parameter	(t-stat)
Constant	0.7764	(3.16)	0.8206	(4.86)
Technology (lagged 2 years):				
Suburban double-decked carriages	-0.3448	(-2.15)	-0.3313	(-1.97)
ESR	0.1815	(0.14) ns	0.1145	(0.01) ns
Management (lagged 1 year):				
Winsor	-0.1292	(-0.84) ns	-0.5368	(-0.36) ns
McCusker	-0.1643	(-0.62) ns	0.8689	(0.03) ns
Shirley/Trimmer	0.1525	(1.26) ns	0.1591	(1.26) ns
Reiher/Hill	0.1114	(0.98) ns	0.1333	(1.13) ns
Johnson/Sayers	0.1197	(1.04) ns	0.1413	(1.20) ns
Goodness of Fit Statistics:				
OLS R-squared	0.99		0.95	
Log-likelihood	0.93		0.90	

Interurban market segment

Explanatory variables	GTFPd		GTFPs	
	Parameter	(t-stat)	Parameter	(t-stat)
Constant	1.0729	(1.17)	0.9703	(1.16)
Technology (lagged 2 years):				
Interurban double-decked carriages	0.2938	(0.61) ns	0.4560	(0.61) ns
Management (lagged 1 year):				
Winsor	—	—	—	—
McCusker	-0.3490	(-3.05)	-0.3622	(-3.95)
Shirley/Trimmer	-0.2713	(-2.86)	-0.3622	(-3.62)
Reiher/Hill	-0.2862	(-3.02)	-0.3000	(-3.83)
Johnson/Sayers	-0.2674	(-2.97)	-0.2864	(-4.09)
Goodness of Fit Statistics:				
OLS R-squared	0.86		0.93	
Log-likelihood	0.34		0.38	

Country market segment

Explanatory variables	GTFPd		GTFPs	
	Parameter	(t-stat)	Parameter	(t-stat)
Constant	-3.6514	(-4.34)	-0.6044	(-1.28)
Technology (lagged 2 years)				
Dieselisation/Phase-out of steam	-0.1454	(-2.01)	-0.9201	(-2.26)
XPT trains	-0.2002	(-2.16)	0.3837	(0.74) ns
Management (lagged 1 year):				
Winsor	-0.5287	(-8.38)	-0.1792	(-5.06)
McCusker	-0.5607	(-6.05)	-0.1917	(-3.68)
Shirley/Trimmer	-0.5649	(-6.67)	-0.1654	(-3.47)
Reiher/Hill	-0.6950	(-9.02)	-0.2036	(-4.70)
Johnson/Sayers	-0.4430	(-6.29)	-0.1199	(-3.03)
Goodness of Fit Statistics:				
OLS R-squared	0.95		0.92	
Log-likelihood	0.39		0.63	

Interstate market segment

Explanatory variables	GTFPd		GTFPs	
	Parameter	(t-stat)	Parameter	(t-stat)
Constant	-1.2294	(-1.300)	0.2852	(0.46)
Technology (lagged 2 years):				
Dieselisation/Phase-out of steam	-0.1234	(-1.47) ns	-0.5992	(-1.08) ns
Management (lagged 1 year):				
Winsor	0.6905	(2.86)	0.5010	(1.11) ns
McCusker	0.3854	(0.37) ns	0.1416	(2.07)
Shirley/Trimmer	0.1117	(0.12) ns	0.1406	(2.26)
Reiher/Hill	-0.3688	(-0.42) ns	0.1109	(1.90)
Johnson/Sayers	-0.9326	(-1.19) ns	0.5297	(1.02) ns
Goodness of Fit Statistics:				
OLS R-squared	0.85		0.76	
Log-likelihood	0.33		0.50	

Notes:
Method: Time Series with PDL. All exogenous variables are (1,0) dummies.

(1) The regressors are applied to all market segments in turn. Also applied are five technology dummy variables, but not to all markets.

(2) ns means not statistically significant at acceptable levels of confidence. An interpretation of these results is given in Section 8.5.

8.5.1 Management Variables

MG 1: The Winsor era

Table 8.1 (summarised below) shows for this era significant negative coefficients for the management variable, lagged by one year, including two (the Suburban market) which are not statistically significant.

Market	GTFPd	GTFPs
Suburban	-0.1292 ns	-0.5368 ns
Country*	-0.5287	-0.1792
Interstate	0.6904	0.5010

Note:
* Includes Interurban at this time.

The presence of negative coefficients for management variables was first identified in the Australian Railways Study (Hensher et al. 1995), such as in Victoria, where planned organisational reforms in 1972/73 proved ineffectual. Negative coefficients give statistical expression to aspects of failure management already identified in relation to the Winsor era—institutional failure in the form of a high turnover in Ministers of Transport, technological failures in the form of worn out infrastructure and rollingstock, and materials shortages and of course, the underlying market failure. As we have seen, Winsor's marketing efforts were able to ameliorate these failures but not sufficiently in the case of the Suburban and Country markets.

This result supports the four working hypotheses and four overarching hypotheses. Although Winsor was able to increase patronage by some 13 million journeys, this increase was insufficient to counter increasing labour, capital, fuel and materials costs in the Suburban and Country markets.

The positive coefficients for the Interstate market suggest that Winsor's marketing efforts had some success. The strategy adopted was to offer a significant increase in seat kilometres by using rollingstock capacity redeployed from other parts of the system. Even a modest response by the market achieved some improvement in factor productivity.

The Winsor era came to an end in June 1956 but a number of strategic decisions taken by him were adopted by his successor in the following year. First, Winsor had drawn up plans to reduce the mounting deficit by cuts in labour numbers. A cut of 1.7% was achieved in 1956/57 by Winsor's successor but Winsor had proposed deeper cuts. The negative impact of ill-considered fare increases in July 1956 (30 per cent in metropolitan fares and 15 per cent in country fares) was ameliorated for a time by the market goodwill generated in the Winsor era.

The statistical non-significance of the management variable for the Suburban market points to one of the most profound lessons of this whole study. Every morning of every working day in Greater Sydney, some 800,000 persons commute by rail to work, school and shops, mostly returning home the same way. And every morning consists of mostly 8-car double decked trains carry the commuters to their destinations on time, in cleanliness and comfort. These trains operate on a very complex network; the systems, operating protocols and procedures having been established in the 1920s, when the bulk of the network was laid down. So robust is this network and systems, that it has rarely failed and then only as a second-order consequence of a management failure elsewhere, e.g. Philip Shirley's railway timetabling changes in 1975. The network and systems are serviced by railworkers and their immediate supervisors in essentially the same way since their inception in the 1920s. The infamous "fifteen layers of management" discovered by the incoming Greiner Government in 1988, had occurred in levels above the workers and their supervisors who serviced the network. It was a foolish management that attempted to tinker with the network. What has changed since the 1920s is the growth of a large bureaucracy of functions which are there to respond to all kinds of imperatives other than the safe, on-time running of trains for Sydney's peak-hour travellers. This situation is best illustrated by the following labour statistics:

	Labour numbers servicing the Suburban market 1951/52	1991/92
Train Running *	5323	2125
Terminal (Station) Running *	2923	1950
Corridor Running *	1368	495
Business & Corporate Admin.	1817	2700
Total	11431	7270

Note:

* Included here would be additional peripheral management functions not directly associated with serving the peak-hour traveller.

When this phenomenon is associated with the already well-discussed lack of marketing and strategic management overall, then it becomes much clearer why the management variable should be non-significant for the Suburban market. It also explains why management is statistically significant for Country and Interstate markets. The markets were smaller and more sensitive to management initiatives, such as they were.

MG 2: The McCusker era

During the whole period of his tenure, McCusker kept Gross Total Factor Productivity above the benchmark 1.0, earning him the title of the best failure manager from 1951/52 to 1991/92. But, as the following coefficients suggest, it was not sufficient, and adds further evidence to support the four working hypotheses and four overarching hypotheses.

Table 8.1 (summarised below) shows the coefficients for MG 2, lagged by one year.

Market	GTFPd	GTFPs
Suburban	-0.1643 ns	0.8689 ns
Interurban	-0.3490	-0.3622
Country	-0.5607	-0.1917
Interstate	0.3854 ns	0.1416

Again, a positive coefficient for Interstate services reflects the introduction of overnight express trains between Sydney and Melbourne, and other marketing initiatives to boost interstate rail travel despite the fact that even elementary market research would have revealed that Australia was on the threshold of relatively cheap interstate air and coach travel. This suggests the non-significance of TFPd. Also, once again, management of the Suburban market is non-significant for the reasons explained above.

When Philip Shirley took over the reins in late 1972, he inherited difficulties that had begun in 1967/68, were gathering momentum, and would boil over in 1972/73. Decisive executive action in that year, and strong political backing could have, at the very best, slowed the momentum of these negative influences on factor productivity. They are discussed in Section 8.4 above and only need a brief reiteration here. McCusker's acquiescence on the completion of the Eastern Suburbs Railway distorted the capital spending program and prevented funds going to a technologically failing railway. Increasing industrial unrest presaged a major breakout in labour costs (only McCusker's personal gravitas had held the unions in some restraint) and the crowning folly of the 1971/72 fare increases which led to a significant drop in patronage in 1972/73.

MG 3: The Shirley/Trimmer eras

Table 8.1 (summarised below) shows the coefficients for MG 3, lagged by one year.

Market	GTFPd	GTFPs
Suburban	0.1525 ns	0.1591 ns
Interurban	-0.2713	-0.3622
Country	-0.5649	-0.1654
Interstate	0.1117 ns	0.1406

In this case, the Suburban and Interstate markets show positive coefficients. In the case of the Suburban market, passenger kilometres declined by 7.5% and capital costs and labour costs increased by 36.8% and 22.2% respectively. However, seat kilometres increased by 13%, fuel costs were reduced by 27.6% and material costs by 10.5%. In the case of the Interstate markets, passenger kilometres increased by 7.7% and seat kilometres by 1.5%. The phenomenon of the well-travelled subsidised aged pensioner had begun to emerge in a significant way on interstate services, pointing to the growing irrelevance of management's efforts to win significant market share from air and road coaches. Management continued to be non-significant in the Suburban market.

The final year of disarray of the Shirley/Trimmer eras is documented in Chapter 6 and Section 8.4. However, at the officer level much useful work was being done to prepare the way for a new chief executive and the advent of a new Government. This occurred in May 1976. A considerable level of planning had been undertaken and initiatives prepared. Whilst most were taken up, some critical ones were ignored until too late. For example, the parlous condition of track and bridges was pointed out in March 1976, by eleven courageous senior engineers. The Granville disaster occurred in January 1977.

MG 4: The Reiher/Hill eras

Table 8.1 (summarised below) shows the coefficients for MG 4, lagged by one year.

Market	GTFPd	GTFPs
Suburban	0.1114 ns	0.1333 ns
Interurban	-0.2862	-0.3000
Country	-0.6950	-0.2036
Interstate	-0.3688 ns	0.1109 ns

In this case, only the Suburban market shows positive coefficients for both GFTPs and GFTPd. This covered the period from 1976/77 to 1985/86 and corresponded with the Wran Governments. Wran won government on public transport issues, and retained government by public transport upgrading particularly in the suburban network. Passenger kilometres and seat kilometres in the period increased as follows:

	Passenger Kilometres (millions)	Seat Kilometres (millions)
1976/77	3093	8834
1977/78	3097	8860
1978/79	3056	8835
1979/80	3501	9285
1980/81	3544	9692
1981/82	3700	10875
1982/83	3455	11313
1983/84	3400	11425
1984/85	3366	11393
1985/86	3675	11351

A number of studies were undertaken in an effort to explain the cycles in suburban passenger demand in particular. The unstated, underlying objective in a number of these studies was to establish a causal link between what management thought it was doing and changes in demand. None could ever be found. However, the publicity attendant with the delivery of every shining new carriage or the latest "sausage sizzle" barbecue on a newly painted railway station was designed to convince everyone that these were significant positive steps in winning back patronage. Although several grand plans were looked at, management left the operational side of the suburban network alone. The "Shirley Temple Timetable" was still fresh in everyone's minds.

Whilst capital costs rose sharply due to investment in new rollingstock and infrastructure upgrading, labour costs fell in real terms from $336 million in 1976/77 to $280 million in 1985/86.

Hill was the first of the Change Agents, as was demonstrated in Chapter 6. As such he laid a solid organisational foundation and a calm industrial climate for the Johnson/Sayers eras.

MG 5: The Johnson/Sayers eras

Table 8.1 (summarised below) shows the coefficients for MG 5, lagged by one year.

Market	GTFPd	GTFPs
Suburban	0.1197 ns	0.1413 ns
Interurban	-0.2674	-0.2864
Country	-0.4430	-0.1199
Interstate	-0.9326 ns	0.5297 ns

Again, only the Suburban market shows positive coefficients for both GTFPs and GTFPd. Suburban passenger kilometres and seat kilometres increased as follows:

	Passenger Kilometres (millions)	Seat Kilometres (millions)
1986/87	3748	11408
1987/88	4111	13151
1988/89	4193	13014
1989/90	4230	13562
1990/91	4283	12585
1991/92	4143	13373

Although some improvements were in the name of "demand-based timetabling", they were essentially at the margins of the network.

The conclusions which may be made regarding the non-significance of the Suburban Management variable from 1951/52 to 1991/92 have profound future strategic consequences. First, the network and systems which were laid down by JJC Bradfield in the 1920s was close to being operationally optimal. Thus, any attempt to make major changes generally had significant adverse consequences. New rollingstock, better signalling etc., improved comfort and safety but not overall operational performance. Management learned to leave the basic operating system well enough alone. A radical re-design of the system, by management, can enhance it and make the management variable significant. Another possible way is to develop a more sophisticated understanding of Suburban market needs, with a view to increasing patronage.

In addition, both capital and labour costs were reduced or contained, in real terms.

8.5.2 Technology Variables

Technological changes in the Suburban market

Table 8.1 (summarised below) shows the coefficients for the two Suburban technological changes, lagged by two years.

Change	GTFPd	GTFPs
Suburban D-D Carriages	-0.3448	-0.3313
Eastern Suburbs Railway	0.1815 ns	0.1145 ns

One change has negative coefficients and one positive, so it is instructive to compare and contrast the two, drawing on the detail contained in Chapter 5. The suburban double-decked carriage was the engineers' answer to the over-crowding of the "red-rattler" single-decked carriages during the sharply peaked demand periods. The double-decked carriages went through several design changes from their first introduction in 1963/64 until the Tangaras finally replaced the last "red-rattler" in 1991/92, 28 years later. The first version of the double-decked carriage, the so called "Tulloch" car, had considerable innate design problems which slowed their delivery into service. The two-year distributed lag model is thus a useful analog for this event. The double-decked carriage was introduced in 1963/64 when 3,776 million passenger kilometres were travelled. No market research was undertaken, and no thought given to the rising "urban sprawl" in Sydney, or the approaching sharp rise in motor vehicle usage. The usage of suburban rail transport began its long downhill slide at about this time, and the 1963/64 patronage was not passed again until 1987/88. The single-decked carriages were replaced by double-decked stock on a one-for-one basis which increased seat kilometres from 6,934 million in 1963/64 to 13,373 million in 1991/92. This led to substantial excess capacity in the off-peak periods. As was shown in Chapter 5, the improvement in cost of services was limited.

Here again a negative coefficient supports the four working hypotheses, in particular capital productivity. The conversion of the suburban fleet to double-decked carriages was achieved at a very substantial cost. It would have needed a very substantial and sophisticated marketing program to fill the approximately 9,000 million empty seat kilometres which existed by 1991/92.

The Eastern Suburbs Railway (ESR) presents positive coefficients but this result needs to be qualified. As shown in Chapter 5, it was 90 years in construction, being finally completed in June 1979 at a cost of $168 million (current dollars). In its first year of operation, it attracted 18.7 million passengers partly due to a temporary "sparks effect", created by the novelty of a new railway. Patronage dropped back to 14 to 15 million passengers per year thereafter and included many bus travellers whose services had been discontinued. ESR patronage represents about 6 per cent of total suburban patronage. The two year lag provides a suitable way of dealing with the "settling-in" period of the new railway (and especially ticketing machines and other equipment). In any benefit/cost terms the ESR represents a poor return on investment as indicated in Chapter 5. Furthermore, Table 8.1 shows that the "ESR effect" was not statistically significant in its impact on TFP. This has profound implications strategically and suggests that strategic transport planners should very carefully consider the objectives of any future extensions of the Sydney Suburban network.

Technological change in the Interurban market

Table 8.1 (summarised below) shows the coefficients for the Interurban Double-decked Carriages.

Change	GTFPd	GTFPs
Interurban D-D Carriages	0.2938 ns	0.4560 ns

The interurban double-decked carriage was first introduced in 1969/70, and there were still a significant number of single-decked carriages in service in 1991/92. As in the case of early suburban double-deckers, there were initial design problems. So a two year lag seems appropriate here also. Whilst there is an excess capacity during off-peaks, the commuter demand growth has mainly contributed to the creation of a positive coefficient. In 1969/70, 155 million passenger kilometres were travelled on interurban services. In 1991/92, passenger kilometres travelled reached 921 million. Nevertheless, this technological change variable presents as statistically non-significant. This lends support to the evidence in Chapter 5 that there was a gross over-investment in interurban rollingstock, leading to significant excess capacity.

Technological changes in the Country market

Table 8.1 (summarised below) shows the coefficients for the technology variables in the Country market.

Change	GTFPd	GTFPs
Dieselisation/Phase-out Steam	-0.1454	-0.9201
XPT trains	-0.2002	0.3837 ns

Dieselisation commenced just before 1951/52 and was not completed until 1966/67. Again mistakes were made in the early years with some imported locomotives. Whilst this legitimises, to some extent, the two year lag, mistakes and technical problems have periodically haunted diesel locomotive acquisition programmes throughout the study period. As Chapter 5 shows, dieselisation did have a significant impact on train running costs. However patronage decreased by 13 per cent between 1951/52 and 1966/67.

The XPT train may also be regarded as having a negative coefficient. It was introduced in 1982/83 without market research and with primitive marketing and when the market for Country rail services was in a terminal decline. It was technically brilliant, at the leading edge of world rail technology, but wasteful in terms of resources that failed to generate interested patronage. Between 1982/83 and 1991/92, Country patronage dropped by 23%, the bulk of the remaining passengers being concession fare travellers. The data also shows that GTFPs is statistically non-significant.

Technological change in the Interstate market

Table 8.1 (summarised below) shows the coefficients for Dieselisation/Phase-out of steam trains in the Interstate market:

Change	GTFPd	GTFPs
Dieselisation	-0.1234 ns	-0.5992 ns

The dieselisation of Interstate services was undertaken in tandem with Country services from 1951/52 to 1966/67. The program suffered from similar technical problems in its early stages. The difference was that whereas dieselisation of Country trains enabled a strategic withdrawal from unprofitable branch line services, dieselisation in the Interstate market was accompanied by the introduction of new services and vastly improved passenger comfort. However, changing market trends were not considered as motor coaches, motor cars and relatively cheap air travel overtook rail in the Interstate market. Again, this technological change was shown as non-significant, statistically.

8.5.3 Economies of Scale, Density and Composition of Service

In the comparative study of Australian railways (Hensher et al. 1995), some useful conclusions could possibly be reached on the density effects of the different railway systems (where unit costs fall when output growth is within a network) in contrast with economies of scale, where output growth is due to expansion of the network.

Such conclusions cannot be readily made when comparing market segments within a single railway system. In the case of NSW, there are significant differences between the sizes of market segments with Suburban services providing 74 per cent of total seat kilometres of all services. However, ready conclusions on scale and density variables are not possible because of train operating realities, as follows:

1. The NSW Railways network is a radial system with the centre focused on the CBD of Sydney.
2. In terms of the availability of track possession by a train service, the most critical point of the network is the Suburban one (some 1302 track kilometres), comprising only 24 per cent of the network. On this part of the network run all passenger trains and a significant number of freight trains. Allowance has to be made for track maintenance that needs to be carried out at regular intervals
3. Nearly all of this track was designed and laid down in the 19th and early 20th Century, and is obsolescent in many respects. In particular, it prevents the modern rollingstock from optimising their operating characteristics in terms of speed, acceleration, etc. Obsolescent track also needs constant care and maintenance.
4. In the relatively short morning and afternoon peaks, finding sufficient train paths through the Suburban network, for all passenger trains (including some Interstate and Country trains) and some freight trains, is a train controller's nightmare.
5. Because the Suburban network is operating close to capacity in the peaks, any event which disrupts the system at these times has major second order impacts throughout the network.
6. The Suburban network is essentially geared to the movement of suburban trains towards the CBD, during peak periods. All other passenger services obtain their train running priorities after this, even though their origins and destinations are also the CBD.

Thus, if economies of density exist then they essentially apply to a radially laid down, limited network of suburban railway track which is required to service all passenger market segments during peak periods. With modern rollingstock and centralised signalling systems, it does this very efficiently. But, because the Suburban market "owns" the critical points of the network, other segments obtain their priorities after this market has been served.

8.6 CONCLUSIONS

This Chapter is the statistical linchpin that binds the other Chapters containing the other elements of the Performance Assessment Portfolio for NSW rail passenger services from 1951/52 to 1991/92: it integrates Chapter 5 which generally analysed the effectiveness of technological changes, Chapter 6 which generally analysed the effectiveness of management, and Chapter 7 which established the Partial Productivity Indicators (PPIs), leading to 4 working hypotheses and 4 overarching hypotheses.

This Chapter demonstrates that GTFP, and the modelling of sources of variation, are sensitive indicators of the economic performance of a business firm, down to the level of market segments and probably further if the data were available.

Most importantly Chapter 8 validates the Hypotheses established in Chapter 7. The analysis of GTFP makes it extremely clear that market failure arising from the Railways' initial monopoly position has never been seriously addressed. Institutional failures arising from the Railways' role as a government institution litter the 41 years examined. These originating failures have had "knock-on" effects, i.e. misguided investments at great capital cost and escalating losses which at times have endangered State Budgets. It is also clear that a strong and sustained growth in demand for rail passenger services is a necessary requirement for a sustained recovery in labour and capital productivity. But there is now a fundamental mismatch between high performance rollingstock and a 19th Century corridor design. This mismatch can only be addressed at considerable capital cost. If such a mismatch is to be rectified, it is best done outside a failure management culture.

The statistical non-significance of a number of variables suggests some quite profound conclusions. *First,* there is the non-significance of all management variables in the Suburban market. This leads to the important conclusion that the network and systems laid down in the 1920s were so close to operational optimality that any major change in operating conditions (especially in the peak periods) will have serious adverse consequences on the delivery of services. Managements have therefore been content to generally tinker only at the margins. However, where they could have made a difference (in fully understanding and developing latent demand) they failed to do so. *Second,* there is the non-significance of all the management variables in the Interstate market, after the Winsor eras. This reflects the consequences of the major strategic blunder of expanding Interstate services (for political reasons) just when airlines and road coaches were moving in to develop this market. *Third,* there is the non-significance of the technology variables, the ESR, interurban double-decked carriages and the dieselisation of interstate services. All of the results support the general conclusions regarding those technology changes: that in the ESR's case, it was an ill considered investment; that in the case of interurban carriages, it was a gross overinvestment in rollingstock; and in the case of dieselisation of interstate services, it was a significant strategic miscalculation of market demand.

CHAPTER NINE

Conclusions on Future Strategic Directions

9.1 INTRODUCTION

This thesis would simply be an exercise in pedagogy unless it can be used to illuminate strategic options for the future. We look at these options in relation to the issues identified in Chapters 5 to 8. In broad terms, these issues correspond with those first identified by Philip Shirley in 1972, namely corridor design (incorporating quantity and quality of railway track and infrastructure including stations) improving patronage, organisation structure and management practices, decision making processes and hard data for management.

9.2 CORRIDOR DESIGN

Despite the urban freeway system and other major road improvements, Sydney's urban shape remains as it was determined by JJC Bradfield, and the rail network he laid down at the beginning of the 20th Century. Motor vehicles still travel at about an average 25 kilometres per hour in the peaks and a little faster in the off peaks.

Apart from the Sydney CBD, there are now about 20 to 30 suburban (and a few interurban) major commercial centres either competing with (or complementary to) each other and the CBD for businesses, jobs, entertainment centres etc. Nearly all contain major railway stations but few can offer cost efficient streetscapes and unlimited parking for motor vehicles. In order to skew modal share permanently in favour of rail in these commercial centres, the railway track needs to be redesigned to carry faster train services between commercial centres and the CBD. This will also break the deterministic grip which the network has had upon management's operational options since the 1920s and allow management to exercise significant strategic initiatives in suburban operations. However, it presupposes a major innovation in the management of marketing which will encourage people to use the train.

In relation to Country and Interstate services not much more can be done. These services are now irretrievably downsized, users of spare freight line track capacity and mostly subject to freight operating constraints. At worst, they will eventually wither on the vine and at best, can be upgraded into novelty tourist trains operating on cost-plus margins until rollingstock needs major maintenance. The future of long distance rail travel in NSW rests with high speed trains (using parts of the old Country and Interstate corridors) with access to the Central and Regional Business Districts of Sydney, and other NSW cities. These are high commercial risk ventures which are best left to the private sector.

In relation to the rail corridors serving Suburban and Interurban markets, there is a need to improve train speeds and interchanges with other modes of transport. This will require major re-investment in track and infrastructure, and simply incremental upgrading, with marginal benefits only. After noting the performances of all NSW Governments in the last 40 to 50 years, one would have to seriously question their capacity to make rational commercially-based decisions in the future. This is regardless of whether the owners of the track and infrastructure are insulated from political interference by the somewhat chimerical constraints of "corporatisation". The correct path is probably privatisation. Stations could then be fully developed as commercial centres.

The Government would need to still maintain a regulatory function, specify track speeds and other engineering and safety standards, and monitor commercial and technical performance. Recent experience in Britain, for example, suggests that even in this system, the Government-appointed regulator will be under extreme pressure, from time to time, to do the bidding of the Government rather than be guided by the commercial verities of her/his commission. Great care must be taken, then, in establishing the processes of regulation, standard-setting and monitoring.

From time to time since 1951/52, a mish-mash of "fuzzy logic" welfare arguments have been put up to retain high-cost services or to emasculate well-considered commercial initiatives. This has happened because the political process has been deeply embedded in the structure of railways management. The welfare issues of public transport are best considered separately (as indicated in the Quadrae Model) from the efficient running of passenger trains.

9.3 IMPROVING PATRONAGE

The inescapable conclusion from Chapters 5 to 8 is that NSW rail passenger managements between 1951/52 and 1991/92, have *never* understood the markets they have served, in any sophisticated way. One consequence of this is a pressing need to fill a large number of empty seats, particularly in off-peak periods. This implies finding 9.2 million new passenger kilometres (a 124% increase in present patronage) in terms of Suburban markets and finding 2.9 million new passenger kilometres (a 322% increase in present patronage) in Interurban markets.

It would be naïve to expect the current organisations to change to such a radical extent that they could meet these marketing targets. It is urgently necessary to introduce sufficient competition which will lead to the necessary increases in patronage.

9.4 ORGANISATION, MANAGEMENT, DECISION-MAKING AND INFORMATION

A further inescapable conclusion is that successive attempts to reorganise the Railways have usually had unintended consequences to the detriment of factor productivity. The detrimental consequences have usually been made worse where political meddling by weak Governments has taken place. The one exception was the unique partnership between two very strong personalities, Neville Wran and David Hill. But it was too short-lived and is unlikely to ever occur again. Reorganisations before and since have had the effect of making the Railways more and more dysfunctional.

The most important positive contribution which can be made at the present time, to the future strategic direction of passenger services, is leadership. The kind of leadership needed is very much in the mould of Schumpeter's "New Person" (Schumpeter 1939), mentioned in Chapter 5:

- to reform or revolutionise the pattern of production (of goods/services).
- to act with confidence in the market beyond the range of familiar reference points.
- to overcome the resistance of individuals in the firm who are committed to the status quo.
- to get things done.

History shows that the NSW railways only produced two such individuals in the last 150 years, John Whitton and JJC Bradfield. Both were innovative builders and both were cut down by the State's bureaucracy and political system. Fortunately for Australia, the private sector of the Australian economy produces a good and regular supply of such individuals. However, such an individual would be unlikely to survive in the present environment, and still retain a commercial integrity.

At the official level, there are still no hard data of any level of sophistication on markets or costs. When this situation is combined with the diffuse decision-making processes caused by reorganisations then it is guaranteed that the delivery of services will continue to suffer the "blind-giant" syndrome.

The people of NSW deserve a better rail passenger system than the one they have been forced to suffer since 1951/52. Competition and privatisation offer some hope that improvements might be achieved. Public ownership and management manifestly failed between 1951/52 and 1991/92. Indeed, NSW rail passenger services represent some kind of an Australian paradigm for mismanagement in that period. It would be wishful thinking to assume that the leopard may change its spots in the future.