

CHAPTER SEVEN

STRUCTURAL IMPROVEMENT OF SOUTH AFRICAN MARITIME SUPPLY CHAINS

7.1 Restructuring constraints

Consideration is given in this chapter to maritime supply chain structures that would be conducive to greater efficiency than the structures of the major maritime supply chains currently serving South Africa. The definition of a maritime supply chain for this purpose is that derived in Chapter Two, section 2.1, namely, the intermodal movement of goods comprising imports or exports from one place to another in a sequential chain of operations.

An important feature of the structures of all the domestic supply chains considered in Chapter Four is the public stakeholding in their links through the role of Transnet, as described in Chapter Three, section 3.2. It is recognised that the links in those supply chains that comprise core assets of Transnet will not be sold by the Government and that privatisation in that form is not a proposition for any change in the supply chain structures, for the reasons explained in section 3.3. Furthermore, it is also recognised that any restructuring of the supply chains involving Transnet will be unacceptable to the Government unless such restructuring promotes black economic empowerment in the manner described in section 3.4 and in accordance with the scorecard contained in Addendum A. While the first condition precludes the sale of the state assets included in the supply chains considered and so renders the target for black ownership in the Maritime Transport and Services Industry BEE Charter less achievable, public-private partnership schemes in place of outright privatisation enables the Government to promote black economic empowerment by choosing partners for Transnet and dictating the terms of the partnership.

7.2 Supply chains considered

The supply chains considered in this section are those dealt with in Chapter Four. In particular, account is taken of the large investment in infrastructure and technology in the bulk supply chains, as evidenced by the features of the specialised railways and loading appliances described in sections 4.2.1 – 4.2.3 and of the complexity of the functions involved in the logistics of the intermodal movement of containers, as described in sections 4.3, 4.4 and 4.5. Account is also taken of the structures of the selected maritime supply chains overseas dealt with in Chapter Five in order to highlight features that contribute to their reputed efficiency, notably the extent of the integration of their links.

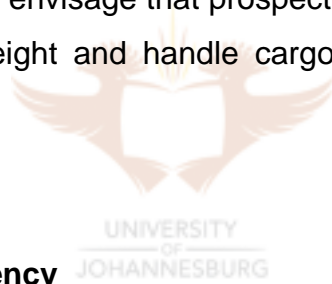
7.3 Integration of marine links

In Chapter Six, the motivation for the integration of control over the marine links in South African bulk export chains is described as well as the developments that motivate liner companies to integrate the port and overland transport links in maritime supply chains under their control. Traditionally South Africa has relied mainly on foreign third party suppliers of marine logistics in the development of the supply chains on which the country depends for imports and exports, which avoids the risks of investment in marine transport (see sections 6.3 and 6.4). Structural change to integrate marine links into the overland links of bulk export supply chains and vice versa for container supply chains could add to their cost-efficiency. The prospect for such integration in individual chains is dealt with in section 7.13 of this chapter.

7.4 Management of maritime supply chains as entities

In section 2.1, an integrated intermodal supply chain is defined as an intermodal supply chain managed as an entity. The term “managed as an entity” with reference to supply chain integration in this chapter, means managed for the purpose of the whole chain. As that purpose, according to all

definitions of supply chains, is to deliver the product at the lowest cost, integration implies the elimination of the management of individual links for profit and by implication the amalgamation of their cost structures. The assets of the links might be owned or leased as long as rentals are market-related. An integrated supply chain is accordingly a chain that no longer constitutes a sequence of profit-seeking links each striving to maximise the value of their assets, but rather a process that maximises the time and place utility of the product it carries. The profitable operation of a supply chain as an entity does not deviate from the principle involved, rather from its application. In a free market, there is often no alternative to that deviation if the disparity between the capacity of the chain and the size of consignments for individual cargo-owners is large. The profits of the supply chain and their effect on the landed cost of the goods delivered can be eliminated if the chain is managed as a public utility by a government body. The supply chain integration advocated in this chapter does not envisage that prospect, although Transnet's predecessor (SATS) did carry freight and handle cargo in ports at below cost (Ramos, 2005).



7.5 Supply chain efficiency

A difficulty when advocating improvements to the structure and operation of maritime supply chains is to measure their relative efficiencies in order to identify reasons for differences in performance. It is obvious that in the nature of their function in international markets no absolute criterion for efficiency could exist. A pragmatic criterion is to regard the supply chain of a good as efficient or at least not inefficient if the costs of its use do not eliminate the comparative cost advantage of the good at its source, and especially efficient if those costs enable a comparative cost disadvantage at the source to be overcome in the market. That is an empirical test, however, which does not provide a criterion for deriving the structure and organisation that is most conducive to supply chain efficiency.

Reliance cannot be placed on costs to measure comparative efficiency, mainly because no unequivocal meaning can be attached to the connotation of 'costs', nor is there any uniform method whereby costs can be calculated. Costs taken to account for the financial statements of logistic firms are largely influenced by the methods of apportioning joint and common costs and imputing the costs of wear and tear, which can differ substantially. There is also the question of whether fully-allocated or marginal costs should be compared and if the latter, whether those should be short or long-term marginal costs and whether long-term marginal costs are different from average costs. Opportunity costs should really provide the criterion for cost comparisons, but as such costs apply only at the time of their calculation, consistency for purposes of comparison cannot be ensured¹⁾. Although it is feasible to compile a complete set of accounting prices from which to derive a *numéraire* (Cassell's Compact Dictionary, 1968, s.v. '*numéraire*') for the purpose of objective cost comparisons within a country, that is a formidable task which has been undertaken only in a few small developing countries (Little & Mirrlees, 1968) and is not a practical proposition in developed economies. To quote an example of the problem of cost identification, Haralambides, Verbeke, Musso & Benacchio (2001) state in a study concerning port financing and pricing in the European Union that "prices in service or comprehensive ports reflect a multitude of different costs – many of them joint costs, difficult to allocate in a way that is not largely arbitrary".

Christopher (1998), points out that supply chain performance needs to be measured relative to competition and "best practice", but that the measures can only have meaning when they are compared against a benchmark. Furthermore, he emphasises that customers' perceptions of performance are paramount and that not only output should be measured, but also the processes that produce the output. The philosophy underlying the benchmarking of the logistics process is accordingly to improve the process in order to ensure customer satisfaction with the end result. The process in maritime supply chains includes the manner in which the links are structured and function.

One method used to measure the efficiency of a supply chain is the ratio of value-adding time to total throughput time, expressed as a percentage. By mapping the processes and activities in a maritime supply chain those that add value, for which customers are willing to pay, can be identified. For example, value is added by moving cargo while non-value-adding time is incurred when the movement of cargo is held up in ships queuing to berth or awaiting offloading in ships alongside quays or in containers stacked at terminals awaiting clearance. Although percentages of value-adding time in total throughput time might be comparable in some circumstances, it is often difficult to draw objective conclusions from such statistics because of inaccuracy in the measurement of process times, uncertainty about whether value is added during any time period²⁾, difficulty in determining the period over which the observations should be averaged in order to calculate representative percentages and the allowance that should be made for contingencies that render some wasted time unavoidable. Furthermore, value is not added or subtracted consistently during any interval of time – for example delays to perishable cargo might be more costly the longer the delays continue. Various other statistics can be used to measure performance, but the difficulties in deriving objective conclusions are similar. Nevertheless, the notion of value being added as the cargo moves along the chain enables conclusions about chain structures that facilitate such movement and the achievement of high performance percentages is undoubtedly significant. That notion is also useful for the purpose of identifying the proper function of the links in the chain (see [section 7.15](#)).

The value-adding performance of the supply chain does not necessarily reflect customer satisfaction and a more comprehensive measuring instrument is needed in order to apply that criterion. Lai, Ngai & Cheng (2001) explain an “on-going study which aims to develop such an instrument for measuring supply chain performance in transport and logistics related industry”. The preliminary framework for the instrument is the SCOR model developed by the Supply Chain Council (Stephens, 2000) in which the activities in the supply chain are considered to link the different organisational processes in the chain with four components, namely “plan”, “source”, “make” and “deliver”. Each

component is regarded as a primary process in the supply chain that can be measured for reliability and responsiveness by “customer-facing” performance measures, while the internal performance of the firms involved in the supply chain can be measured in terms of costs and asset utilisation. The intention of the study was to identify and refine the processes to be measured in each of the components of the SCOR model through group discussions and a pilot study and, eventually, to calibrate the measuring instrument through a large scale mail survey among transport and logistics-related service firms. The data would be analysed through factor analyses using a structural modelling technique.

Although no results of the study could be obtained, logical premises in its design support conclusions evident in the examination of the structures of the maritime supply chains described in this thesis. These are that:

- “the management of a supply chain involves not only the internal processes of a firm, but also requires the integration of those of the partners in the supply chain”
- (The concept of supply chain management) “changes the nature of a firm as control is no longer based on direct control of business processes, but rather based on the integration across the member organisations in the supply chain. The challenge for firms to achieve a competitive edge is to manage the supply chain integration between the member organisations for advantages in cost and service differentiation” (Lai, Ngai & Cheng, 2001).

Supply chain integration is thus believed to be indispensable to its functional efficiency, in the design of the study. However, the researchers implicitly assume, or seem to assume, that the supply chain is then managed by the suppliers, but that may not be essential. As integrated supply chains compete as entities, their objective in the market can also be achieved through control by service providers in particular circumstances (see [section 7.12](#)).

7.6 Lack of theories of supply chain or logistical management

A discussion of the structure, integration and management of maritime supply chains would be facilitated if that could take place in the light of a recognised theory of supply chain management (or supply chain structure) or of logistical management, but no such theories exist, which is evident from the diversity of concepts, definitions and descriptions given in [section 2.1](#). Lai, *et al.* (2001) find it necessary for their purpose to adopt the definition of Christopher (1998), which in effect assumes the aim of supply chain management to be that of delivering superior customer value at less cost to the supply chain as a whole. As “superior customer value” and “less cost” are relative concepts – relative respectively to some (unstated) “inferior value” and “higher cost”, the definition does not provide any theoretical conclusions about when a supply chain is efficient. To the extent, however, that customers in the survey by Lai, *et al.* (2001) signify that the value they receive from one delivery exceeds that of another and that the costs (measured consistently in theory) of the one delivery are lower than those of another delivery, the definition adopted by Lai, *et al.* (2001) provides an intuitive rather than a theoretical basis for comparing supply chain performance and by implication supply chain efficiency.

The preceding argument is intended to point out that it may be fruitless to seek a theory whereby the superior efficiency of structurally-integrated maritime supply chains can be motivated and instead to rely on conclusions derived from the micro-economic analyses of the links in the chains. Such an analysis must necessarily concern their cost structures, rather than reported costs, and the extent to which those structures are conducive to the efficient integration of links in the chain in order to avoid disruption of product movement at interfaces, as well as the effect of the structures on pricing policies, including the pricing constraint on public enterprises. The conclusion from the analysis applies to the hypotheses of the study (see [section 1.5](#)).

7.7 Motivation for integrating cost structures

Integrated and autonomous links

The cost structures of the individual links in maritime supply chains largely determine the scope for improving the overall efficiency of the chains through their integration into a single business enterprise. While it can be argued that integrated management does not necessarily imply the integration of cost structures and that each link can function as a separate cost centre under umbrella management, such an organisation virtually precludes scale economies, except perhaps in some overhead expenses. In principle, integrated management enables better co-ordination at interfaces although that depends upon the degree of autonomous performance expected by the management of each link. There can be little doubt that a supply chain functioning as one operation for a single purpose is capable of achieving that purpose more efficiently than a supply chain in which the management of each link is striving to perform efficiently even at the expense of other links. The extreme example of an unintegrated supply chain is one in which each link is managed separately as a profit-seeking enterprise irrespective of the costs it may impose on the operation of other links. Another common example of supply chains in which individual links are managed to serve their own purpose at the expense of the overall efficiency of the chain is encountered when some links comprise the operations of monopolistic public undertakings burdened with costs inflated to meet their social obligations.

Purpose of supply chain operation

The notion that a supply chain can function for a single purpose needs some discussion. That purpose can be the delivery of the product or products it carries to the market at the lowest landed cost, which is the main purpose of supply chain management according to virtually all the literature on the topic quoted in [section 2.1](#), and which serves the business interest of the cargo

owner. Such a supply chain would undoubtedly be the Pilbara iron ore supply chain described in [section 5.6](#). But maritime supply chains can also function as entities for the profit of the supply chain operators, although there needs then to be some synergy between the operators and the users, if the product delivered is to survive in the market. Maritime container supply chains providing door-to-door services internationally are enterprises aimed at achieving profits for the liner companies responsible for their operation and are usually priced at what the traffic can bear on routes where shipping conferences or oligopolistic alliances prevail. The marketability or landed costs of the products carried by profit-seeking maritime supply chain operators is a secondary consideration to the purpose of the operators, although it cannot be ignored, because the cost structure of liner shipping, as explained in [section 6.4](#) requires the volume of throughput to be maximised. That is the objective of value-of-service pricing. This topic is pursued in [section 7.10](#).

It should be noted in this context that although liner companies provide door-to-door container services between South Africa and other countries, undertakings such as ERS (see [section 5.3](#)) do not exist locally and reliance is placed on Transnet as a third party service provider for rail and port services. Although most of the liner companies own road hauling firms, those firms usually operate in the open market as separate profit centres because the utilisation of their capacity can be raised through the provision of services to third parties, especially on back hauls. Their operation as autonomous undertakings in the market consequently results in lower unit costs. However, ownership of the firms enables the liner companies to rely on the supply of road transport, if and when needed. The point to be made is that the few, if any, of the supply chains serving South Africa function as entities with links fully integrated to serve the purpose of the chains, but comprise chains of links each oriented towards seeking their own profits (and meeting social obligations) as their foremost purpose.

7.8 Cost structures of links in bulk supply chains

Overland links

The links in the major chains conveying exports in bulk are described in [section 4.2](#). For the purpose of this section only the cost structures of the mining operations, railways, ports and shipping services need be typified and only those features of the cost structures that need be taken into account for the following discussion have been described.

Mining is characterised by high capital costs and substantial scale economies as output increases to a planned maximum. Railways also have high capital costs with scale economies as the traffic increases, although their capacity can usually be raised substantially through marginal investment in equipment, technological improvement and organisation before large capital outlays are again necessary. Port infrastructure also requires large capital investment which usually creates capacity for utilisation far into the future at low marginal cost. Substantial capital investment is required for cargo handling equipment and although the capacity provided is theoretically finite, in practice its utilisation is erratic according to berth utilisation and well below the theoretical optimum, allowing scale economies as throughput rises. Bulk shipping requires large capital expenditure for capacity that needs to be highly utilised according to the exigencies of the trade for which it is intended and little scope exists for scale economies once ships have been taken into service. The consequence is that bulk ships cannot sustain underutilisation for long and the income from scrapping may well exceed the savings from lay up (Stopford, 1997:485).

The output of the mining operations obviously determines the capacity required of the supply chain. Although the railways and the ports may be required to accommodate other traffic, competent planning coordination with the mine development will enable the rail and port capacity created to match that of the mining output, and for the throughput of a fully-integrated supply

chain to achieve the maximum scale economies as production is raised to the planned limit. In principle, the cost structures of mining, bulk-handling, railways and ports are conducive to supply chain schemes that require large investments to be coordinated in order to maximise the benefit from declining marginal costs for the entire chain as the throughput increases to reach the full planned output. Further investment to raise the capacities of all the links requires similar co-ordination (see [section 4.2](#)). The important fact is that bulk exports in large quantities require simultaneous or at least coordinated investment in specialised infrastructure and equipment, which enables the unit costs of the product delivered on board the ship to be reduced as throughput increases as a result of scale economies by all the links in the chain if the chain functions as an entity. If each link in the chain is operated as an autonomous profit-seeking enterprise, phased investment may not occur and no incentive then exists for a fully-utilised link to expand its capacity and so raise its unit cost in order to reduce the unit costs of other underutilised links. It then becomes a bottleneck that constrains the productivity of the chains as an entity.

In [section 3.2](#), mention is made of capital spending by the SAR&H Administration in pursuance of macro-economic policy. That was inevitable as the Administration was a department of government and such spending, to the extent that it could not be funded internally, contributed to the national debt. Transnet, its predecessor, is now a public company owned by the State and is able to borrow directly in the market, but the timing of its loans is taken in consultation with the National Treasury. To that extent, capital spending by Transnet is undertaken in cognisance of the business cycle and tends to be anti-cyclic. Such timing might not be of much consequence in meeting domestic demand in view of the reliability with which that demand can be forecast and the long gestation period for large projects undertaken by Transnet. But that does not apply to projects designed to meet the demand in the world market for commodities as the timing of the implementation of projects is then all-important.

A related problem stems from the chain leadership. None of the large investment in railways or port facilities needed to export bulk commodities, such as coal and iron ore, would occur (or rationally should occur) without the assurance that the mining output for which the capacity is created will be forthcoming. Thus the viability of the rail and port links in the export supply chain depends entirely on the mining operations and the insight of the market and international demand for the commodities exported over the long term by the investors in such mining. That presupposes chain leadership in effect by the mining investors (see [section 7.12](#)).

When the risks of investment in the rail and port capacity are borne independently of the risks of investment in the mines, the business strategy of the mining investors is to induce the provision of rail and port capacity for all eventualities, while the investors in those links will tend to be cautious about overoptimistic forecasts of the traffic that will be forthcoming and underinvest or require traffic guarantees that might be difficult to obtain without qualification. The outcome can result in uncoordinated development throughout the supply chain and disproportionate risk-bearing by the investors.

As coordinated investment in the capacities of the links in a bulk supply chain can ensure that their marginal costs decrease simultaneously with rising throughput, within a planned maximum, and as the viability of the rail and port operations depends on the leadership of the mining investors, it is evident that the efficiency of the entire chain can best be achieved when it functions as an entity for the sole purpose and at the risk of those investors. The problems with capacity that are being encountered in the operation of the iron ore and coal supply chains in South Africa in the present circumstances are dealt with in [section 3.3](#). In [section 7.13](#), the prospects for public-private investment in bulk export schemes are examined.

Marine links

In the preceding discussion, the assumption is made that the bulk export supply chains will deliver cargo to the ships and not extend to foreign ports. The reluctance of South African exporters, with the exception of those involved in the fruit trade, to assume responsibility for shipping their cargo is explained briefly in [section 6.1](#). By not controlling freight, control is also lost over one of the price elements in the delivered cost. Theoretically, the f.o.b. price of the commodity plus the freight should add up to the quoted c.i.f. price, but in practice the freight charge that either the sellers or buyers of the commodity would bear in most transactions does not correspond, often because shipowners have special relationships with one or other of the parties (Collins, 2000:97). Whoever secures the lowest freight charge achieves the best delivered cost and is able to designate the carrier. South African sellers are usually confronted by foreign buyers in special relationships with their domestic shipowners and are unable to meet the delivered price in the absence of similar relationships of their own. Buyers of large quantities of bulk commodities are invariably favoured by shipowners and their brokers in order to secure further business and thus usually have the advantage in determining the delivered price. In these circumstances and as long as South Africans remain reluctant to invest in ships (see [section 6.3](#)), it will be difficult to extend South African bulk export chains to destination ports through control of the marine leg.

Ship chartering is not the only manner of obtaining control over the marine link – ships can also be acquired and their operation incorporated into the supply chain as an integral part of the business undertaking supplying bulk cargo c.i.f. The motivating arguments are akin to those when comparing the outsourcing of distribution tasks with in-house supply arrangements, but account needs to be taken of the unique features of bulk shipping and the compatibility of its cost structure within the cost structures of the other links in the supply chain. Dry bulk carriers of iron ore and coal are usually Cape size, because of the scale economies as their capacity increases, the limitation being mainly the availability of ports with adequate depth of water and large drydocks, and the

volume of cargo offering in the trade for which they are intended. As the scale economies are substantial, but the capacity of a ship is finite, the business aim of the owners or bareboat charterers is to achieve full or near-full utilisation of the capacity when the ship is brought into service. That aim usually determines the specifications of the ship employed and implies that declining marginal costs are not a feature of the operation of bulk carriers in service in contrast to the exploitation of mines and railways in which the full utilisation of the initial capacity often takes years to reach. In these circumstances, few cost advantages are gained by integrating the operation of bulk ships in the supply chains, as the costs of additional ships to accommodate rises in mining output within the initial capacity provided can be incurred so as to vary with those rises, albeit in a lumpy manner.

Also to be taken into account when considering the integration of bulk shipping in the supply chain, is that ships engaged in cross-trading will achieve higher utilisation than those employed on shuttle services, while the revenue so obtained would reduce the net costs to the supply chain. However, using ships acquired for the purpose of the supply chain in cross-trading would require the mining investors to compete in the bulk shipping market and the effect on the total supply chain costs is unlikely to afford an advantage over the chartering of third party carriers to provide the marine link³⁾, bearing in mind that the availability of bulk shipping for South African cargoes is seldom a problem. Integration of shipowning in the supply chain would, of course, insulate the viability of the chain against high rates when the demand lags the supply, but gains when rates drop would be foregone.

Integration of shipowning in the iron ore and coal supply chains would potentially also bring the benefits of seafarer employment for South Africans, although that needs to be offset by the foreign exchange required to purchase or bareboat-charter ships and to purchase fuel and ship supplies in foreign ports. However the prospects for shipowning by South Africans and the effect on the balance of payments of the country are issues not relevant to the topics dealt with in the thesis.

Marine services in ports

Apart from the costs and benefits of planning, financing, implementing, operating and expanding the mining ventures and the rail and port links in the chain of supply to the cargo holds of the ships, as a single undertaking, without having to rely on autonomous intermediate links seeking profits according to their own business policies, integrated control facilitates seamless transshipment of the cargo at modal interfaces. It is at those interfaces that disruption of supply chains usually occurs. Unfortunately integration of the mining venture with the rail link and port handling in the chain does not altogether resolve that problem. The port link involves two main functions, namely cargo loading and marine services. For example, at the Port of Saldanha, the appliance used to load the ore into ships from trains via stockpiles is an integral part of the rail operation and the throughput is seamless (see [section 4.2.2](#)). Although ship arrivals and departures are coordinated with the rail deliveries, the provision of port capacity and marine services are tasks of the National Ports Authority separate from the cargo handling undertaken by the South African Port Operations, which is also a division of Transnet. The National Ports Authority is thus an intermediate enterprise in the chain. At the Port of Richards Bay, loading of the coal on board ships is undertaken by the Richards Bay Coal Terminal (RBCT), which is a private enterprise of the owners of the coal mines, but the National Ports Authority remains an intermediate service provider of marine services. Although disruption is rarely experienced on either the iron ore or coal supply chains as a result of a lack of port capacity at present, the fact remains that port investment and the supply of marine services are third party activities on which those supply chains are dependent. In many ports worldwide, ships have to queue for bulk cargoes⁴). Supply chain integration does not offer a ready solution to that problem in South Africa in view of the Government's policy towards the privatisation of port land and infrastructure, as explained in [section 3.3](#), although marine services (tug assistance and pilotage) could be candidates for concessioning some time in the future in accordance with the National Ports Authority Act, 2005. Furthermore, investment in port capacity

for bulk export supply chains through BOT schemes by public-private partnerships are feasible in accordance with Government policy (Erwin, 2004).

7.9 Integration of mining operations in supply chains

The argument so far has shown that the most efficient structure of supply chains carrying exports of ores or minerals is likely to be achieved through the integration of the mining operations with the rail transport and port functions in order to achieve the single purpose of delivering the cargo on board the ships. “Most efficient” in this context means at the lowest unit cost for the entire operation and implies that none of the links in the chain function for the benefit of profit-seeking third party service providers. Efficiency will, of course, be promoted also through the single management of the interfaces between the links. As discussed in [section 3.2](#), Transnet (i.e. the Government as sole shareholder) is unlikely to relinquish its ownership of the railways and ports used for the ore and coal supply chains described in [section 4.2](#) and outright privatisation of those links for integration with the mining ventures is at present not a prospect for change. In the nature of the technological design of the rail infrastructure and trains as components of integral systems, separation of their operation from the ownership and maintenance of the track would create unnecessary problems and schemes whereby the trains are privately operated are not propositions. Another alternative, is the nationalisation of the mining operations and the conduct of the export businesses as state enterprises⁵). As described in [section 4.2.2](#), the scheme to export iron ore mined at Sishen started off as a fully-integrated supply chain including the mine, railway and port, all owned by ISCOR, which was a state enterprise at the time. The remaining option is to amalgamate the mining operations and the transport and port loading links in joint ventures between the mining companies and Transnet, and apportion the returns from the export businesses according to the respective shareholdings.

The existing structures of OREX and the Coal line are described in [sections 4.2](#) and in joint ventures single ownership of all the links including the mines

would replace that structure. The need to include the mining operations and ownership of the land and infrastructure of the transport links in the ventures may be questioned. However, the aim of achieving the lowest delivered cost of the mined product in international markets is compromised by separating the viability of the transport links from that of the mining operations. Similarly so, if the ownership of the rail and port infrastructure is separated from the operation of the enterprises and, for example, a return higher than the economic rent is required on the land and infrastructure. If strategic considerations do not allow state ownership of the port and railway land and infrastructure to be relinquished, it should be possible through long leases at economic rentals to transfer near-ownership to the venture without interposing third party profits.

7.10 Cost structures of links in container supply chains



The links in container supply chains are described in [section 4.4](#). For the initial purpose of this section on cost structures, the links of importance are the short-distance road transport, long-distance road and rail transport to and from ports, port terminals, marine services and liner shipping. In contrast to the bulk supply chains where the cost structures of the overland links are typified by decreasing marginal costs, while the marginal costs of the marine links are constant, the overland links in container supply chains include cost structures with decreasing marginal costs (rail transport) and with constant marginal costs (road transport), while decreasing marginal costs typify the marine links, i.e. container shipping. Integration of the links with decreasing marginal costs enables economies of scale to be realised through investment co-ordination to an extent rarely feasible without such integration. The integration of links with constant marginal costs has few cost advantages, through scale economies, but eliminates the interposing of profit-taking by those links, although the entire supply chain might not gain from the integration, as explained in [section 7.15](#).

As the unit of cargo, namely a TEU, corresponds generally to the capacity of a road vehicle used for its conveyance over short distances, the marginal costs of carrying additional TEUs are equivalent to the running costs of the vehicle and do not decrease with the volume of traffic, or rather, vary directly with that volume on a given route. Although the standing costs per TEU carried reduce as more trips are undertaken by a vehicle, fleet sizes are generally planned to ensure high utilisation of individual vehicles, allowing little scope for raising the number of trips undertaken in a time period, and the carrying of additional traffic requires increasing the fleet size. Most of the costs incurred are thus variable.

The cost structure of rail transport has been described in [section 7.8](#), dealing with bulk supply chains, as mostly fixed, because of the high investment in infrastructure, with declining marginal costs as the volume of traffic increases. Although trains carry up to hundred containers on some routes in South Africa, in contrast to the very much heavier trains carrying coal and ores on the bulk supply chains, their capacity for carrying containers is theoretically much higher because trains can be lengthened at relatively low cost, given the availability of wagons and adequate interloops and track signalling. In general, the unit costs of the rail transport of containers decline as the volume of traffic offering increases.

The cost structure of long distance road transport is similar to that of short distance road transport, although the unit of cargo is probably between two and three TEUs⁶⁾. In general, the costs of road hauling containers to and from port terminals over long distances vary with the volume of traffic and there is little scope for achieving scale economies as that volume increases.

The throughput of container terminals at ports depends on berth occupancy, dimension of the ships to be offloaded, number and design of container cranes, speed of handling, availability of stacking space and the size of the areas behind the quays, stacking arrangements, type and utilisation of straddle carriers and forklifts, labour productivity, transport of containers to and from the terminal, organisation of the operation, custom controls and other

factors (Merit, 2001). In general, however, the throughput of the terminal, once the initial investment in infrastructure and equipment has been undertaken, can be raised at decreasing marginal costs per TEU, although inadequacy in the terminal design (for example, lack of back space) can result in rising marginal costs at comparatively low throughput.

The costs of scheduled container shipping are largely fixed and the industry is characterised by scale economies and decreasing marginal costs (see [section 6.4](#)). Shipping conferences, shipping alliances and the amalgamations of shipping lines in recent years in order to achieve oligopolistic control of the markets, all stem from the need to preclude the destructive competition that otherwise would ensue because of the cost structures of the liner companies. Liner companies are also motivated, because of their cost structures, to expand their control over the market by integrating the inland links of container supply chains in their services. (This topic is discussed in [section 6.4](#)). Liner companies accordingly endeavour to construct door-to-door container supply chains by acquiring control over all the links, including port terminals. An example of where liner companies have successfully integrated the inland and marine links is the ERS described in [section 5.3](#). Scope for such integration does not presently exist in South Africa, but public-private participation schemes might enable similar arrangements in effect to be achieved as explained in [section 7.12](#). In contrast to the micro-economics of the bulk supply chains in which leadership must resort with the investors in the mines, liner companies are usually the leaders of maritime supply chains of containers as described in [section 4.4](#), although stevedoring and trucking firms have also expanded vertically for that purpose in some countries, but mainly through the inclusion of coastal shipping⁷⁾.

7.11 Container supply chain integration

Lack of networks of container supply chains

Several door-to-door maritime container supply chains beginning or terminating in South Africa are operated by liner companies (examples are described in sections 4.3, 4.4, 4.5 and 6.4), but networks of just-in-time services radiating from the port container terminals do not yet exist. The prospects for constructing such networks in the interests of greater efficiency in the supply of manufactured imports and exports need to be examined, taking into account the policy of the Government as considered in sections 3.2 – 3.4.

Efficiency of container supply chains

The concept of supply chains of bulk exports in which the mining of products is integrated with rail links and port handling in order to optimise their efficiency is quite simple and in principle accords with the notion of supply chains contained in several of the definitions given in section 2.1. That integrated container supply chains can also deliver products efficiently to markets, especially when the chains function for the profit of liner companies, needs to be explained. Liner conferences have a long history of freight rate manipulation intended to promote the export of raw materials from developing countries for beneficiation in Europe and the import of the products manufactured in Europe in those countries, in the interests of their trade (Stopford, 1997:348). The differential in north and southbound rates, often based on the value of the cargo rather than the costs incurred, is still applied by liner companies supplying services between Europe and South Africa. Given that value-of-service (or discriminatory) pricing is generally intended to exact “what the traffic can bear”, the benefits to importers and exporters when liner companies secure their markets and achieve scale economies by integrating rail services and cargo handling in ports with the marine links, is not evident. In fact, the benefit materialises only when competition in the liner

industry forces rates down and obliges competing liner companies to raise the efficiency of their services, not necessarily by reducing the costs of delivering the cargo, but by supplying services with the qualities required by their customers – services that enable those customers to reduce inventory costs and adapt quickly to market demand, by being reliable, regular and just-in-time. Those benefits, which reflect the efficiency of container supply chains, can best be produced by liner operators as only the latter can integrate the marine link with the other links. Other third party service providers, including Transnet, would need to enter the liner business to do likewise and in any event function then as liner undertakings operating maritime supply chains.

Although only the main elements in the container supply chains were mentioned at the start of this argument, account must also be taken of the lesser links described in section 2.2. The tendency in the maritime industry is for the functions of several of those links, such as freight forwarding and consolidation, ships' agency, chandling and the local collection and delivery, to be integrated in the services of liner operations because of the potential cost savings. Those savings could hardly be realised by the other service providers in the chain, as they are all dependent on the marine links in the chain.

As with bulk shipping, the National Ports Authority is responsible for the port infrastructure and supply of marine services and if those are inadequate, delays to ships could raise container supply chain costs. Their integration into container supply chains could be achieved through the privatisation of ports, which is not an option in terms of the policy of the Government contained in the National Ports Authority Act (Act 12 of 2005).

Unit of cargo and revenue unit


Another consideration that precludes the integration of container supply chains in the manner of bulk export chains is the fact that the cargo unit, namely a TEU, does not always correspond with the revenue unit and containers may contain the consignments of different cargo-owners. No cargo-owner, at least

in South Africa, generates sufficient cargo flow to justify control of an integrated container supply chain for that purpose, although some cargo-owners do rely on their own transport to move containers to and from container terminals and depots.

Conclusion on integration of container supply chains

The conclusion in this section is that there is no alternative to the integration of container supply chains in the services supplied by liner companies if the efficiency of the chains is to be raised (as determined by the quality demanded by customers), provided that the companies experience competition in their markets and that such competition is not rendered ineffective in practice by the shipping conferences. This topic is briefly considered in [section 6.4](#).

7.12 Supply chain leadership



Mention has been made in [Chapters Three, Six](#) and this chapter of the concept of supply chain leadership. As the policy of the Government, explained in [section 3.3](#), is to maintain Transnet's "pivotal and decisive role" within a system of public-private partnerships (Erwin, 2004), it seemingly does not enable the leadership of maritime supply chain integration by mining investors and liner companies. However, public-private partnerships are described in the National Freight Logistics Strategy (National Department of Transport, 2005:45) as "a contract between a public sector institution/municipality and a private party, in which the private party assumes financial, technical and operational risk in the design, financing, building and operation of a project. Historically this has been the model used to fund South Africa's toll roads". In the light of this definition, the concept of chain leadership needs further consideration. The Minerals Council of Australia (2005) maintains that "A key feature of best practice global logistics chains is the development of a chain leader, with responsibility for driving chain improvements". The motivation for the chain leader to drive improvements

should undoubtedly stem from the prospects of gain in countries with economies that are predominantly capitalistic and rely on the free market. The role of state-owned enterprises in South Africa in accordance with the policy of the Government, as discussed in section 3.3, seemingly does not allow scope for private leadership to drive improvements in the rail and port links of existing and new maritime supply chains, but requires the private sector to await the “concessions, joint ventures and PPP (public-private participation) arrangements” (Erwin, 2004) envisaged by the Government. If the leadership of maritime supply chains by mining investors or liner companies is inherent in the structures of the chains, as concluded in sections 7.7 and 7.8, then the role assigned to Transnet in accordance with Government policy may conflict with *best practice* global logistics by frustrating private initiative in developing integrated maritime supply chains.

The policy of the Government assumes that Transnet will lead the development of rail and port facilities, with private participation if it so chooses, assuming that such participation is forthcoming. Although Transnet is required to function as a business (see section 3.2), as a state-owned enterprise it “operates in the market but within rules that are not derived from the logic of the market place alone” (Erwin, 2004). Presumably that means considerations of equity as well as efficiency should rule Transnet’s leadership, which presupposes an additional purpose for maritime supply chain development, distinguishing its leadership from that of private investors. The extent to which the competitiveness of South Africa’s maritime supply chains in world markets should be forgone by tempering efficiency in the interests of domestic income redistribution is an issue at the root of this country’s or any country’s political economy and outside the scope of the topics dealt with in this thesis. It is sufficient to point out that the rules for leadership by Transnet, as a state-owned enterprise in terms of the policy statements discussed in section 3.3, introduce criteria for the development of the rail and port links in maritime supply chains that differ from those of the best global logistics practice.

7.13 Public-private participation in maritime supply chains

The policy of the Government towards the privatisation of the assets of Transnet is described and discussed in [sections 3.2](#) and [3.3](#). In this chapter, the constraints on schemes broadly described as privatisation and the motivation for integrating public and private links in maritime supply chains are examined. As explained, no scope for such integration is promised in the policy pronouncements on behalf of the Government, nor does the role prescribed for Transnet seem to enable integrated development or the relinquishment of leadership in the development of the rail and port links in maritime supply chains. In this section, attention is focused on the strategy for public-private participation schemes in Australia, which has a similar commodity-based economy to that of South Africa and has achieved great success as a competitor in world markets ([see section 5.6](#)).

The Australian Government has endeavoured to develop a “whole-of-chain” approach to transport policy and for that purpose intends to reform the framework for government funding of land transport infrastructure in order “to move away from the entrenched and fragmented approach to investment based on the needs of single transport modes and single jurisdiction” (Minerals Council of Australia, 2005). Sufficient private funding for the infrastructure required for bulk supply chains is not considered to be a problem, but rather the complexity and fragmentation caused by the range of public and private organisations along the transport logistics chain. In order to enable mineral infrastructure projects to be completed as needed, funding contributions by the private sector will be accepted by Australian public enterprises corporatised “to focus on cost minimisation and efficient pricing and to have clear, non-conflicting objectives relating to commercial performance”. Such objectives do not include welfare aims, no doubt on the usual premise that income redistribution is a political task of government itself and that state-owned enterprises should not be hampered by having to pursue conflicting objectives. The principle aim in the development of minerals transport in Australia is to promote more integrated supply chain models (i.e.

“whole” chains) founded on efficiency. Where public-owned links in mineral supply chains exist they should “face no barriers to efficiency and productivity improvement” (Minerals Council of Australia, 2005). As described in [section 5.6](#), the most successful bulk export chain in Australia is the Pilbara iron ore chain in which “the operations of mining, transport and ship loading are highly integrated” and “produce very high levels of efficiency”, which are “a major source of competitive advantage for Australia’s globally traded iron ore” (Minerals Council of Australia, 2005).

7.14 Private operation of container terminals

The Minister of Public Enterprises has stated that a private partner would be brought into the operation of the Durban Container Terminal (Erwin, 2004), while in [section 7.15](#) it is proposed that the container terminal to be built in the Port of Ngqura should be concessioned to a major liner company in the furtherance of maritime supply chain integration. There is a fundamental difference between the operation of a common user terminal by a public-private partnership and the operation of a terminal dedicated to private use by a liner company that needs to be examined in the context of the theory of the function of a port.

Commercial ports in most developed countries are no longer accepted as natural monopolies administered by state bodies to serve their geographic hinterlands, but have come to be regarded (by progressive thinkers) as links in value-driven chain systems (Robinson, 2001). According to Robinson, “ports are operating in a new environment – it is a globalised environment, it is also a corporatised and private environment and it is an exceptionally competitive environment, it is also a logistics-restructured environment”.

The motivation of the Government when entering into a partnership with private investors in the Durban Container Terminal will be to share the costs of raising its capacity⁸⁾ which should enable the problems that for many years have caused congestion at the terminal and delays to cargo to be overcome. It

is intended to raise productivity through the improvement of the infrastructure and equipment of the terminal. The extent to which the private sector will be involved in the operation of the terminal is not known, but the Government does not concede that “the private sector is more efficient than the state” (see [section 3.3](#)). The manner in which private operators raise efficiency, namely by reducing personnel, will in any event not be allowed⁹⁾. In the light of the Government’s declared intentions and the National Ports Authority Act 2005 (Act 12 of 2005), the proposed public-private partnership in the Durban Container Terminal will not change its common user function and charges to users, which might not be subject to regulation (see [sections 3.2](#) and [3.3](#)), will add to the end cost of containers moving in supply chains through the port.

In order to incorporate port terminals into supply chains through vertical integration, liner companies have increasingly invested in container terminals dedicated to their own use over the past ten years. There are many such terminals in Asia and North America and several in Europe. Maersk Sealand as the largest operator of container ships leads in the numbers of dedicated terminals operated, but all the major liner companies have been obliged to integrate terminals into their supply chain services (Haralambides, Cariou & Benacchio, 2002). Haralambides, *et al.* (2002) have developed a queuing model which shows that under certain assumptions a carrier with exclusive access to facilities and the port providing them could both benefit from the strategy, but that other carriers could be the losers through the external effects of the restriction on their access to berths. It is also shown that the external effects could be internalised through the pricing of the exclusive access.

Private container terminals are often used by the major carriers as hubs for the transshipment of containers between large and smaller ships especially on the main East-West and North-South routes of the world, but also enable liner companies to reduce ship turnaround times and raise the efficiency of their global supply chains. The provision of those terminals is also in keeping with the worldwide trend towards privatisation and the reduction of public investment in ports.

Irrespective of whether the common-user terminal in the Port of Durban is henceforth developed through a public-private partnership or not, competition with a private terminal in the port would promote efficiency in the operation of both terminals and avoid the need for price regulation in terms of the new national ports legislation. The efficiency of each terminal would also influence the contest between liner companies in the market for supply chain services and reduce the costs to customers. Adequate capacity at the common user terminal would be essential in order to preclude the exclusivity of the private terminal benefiting the operating liner company by limiting the availability of berths to other liner companies¹⁰. The concessioning of the container terminal to be built in the new Port of Ngqura to a liner operator could serve the same purpose as a private terminal at Durban, but would not restrict the access to container berths in that port (see [section 7.16](#)).

7.15 Independent container terminal operation

In section 3.5.3.2 of the National Freight Logistics Strategy (Department of Transport, 2005), it is stated with reference to the efficiency of the container terminals in South African ports that “a concession of certain terminals in SAPO such as DCT (Durban Container Terminal) would go a long way towards improving efficiency”. In support of that contention, the study adds that “port productivity in South Africa as a measure of efficiency is very low compared with international benchmarks. The Durban Container Terminal lifts on average 17 containers (TEUs) per hour, whereas the international norm is at least 35 TEUs per hour”. It is also mentioned in the study that “in 2001 the cost of inefficiency at Durban Container Terminal alone was estimated at 0.45% of the GDP” which amounted to R459 million at current prices and R426 million at constant 1995 prices (Reserve Bank of South Africa, 2001). As the terminal is available for common use, it would have to be concessioned to an independent container terminal operator, which excludes any of the liner shipping companies serving South Africa.

In recent years, several dominant international container terminal operators have emerged through strategic partnerships, mergers and acquisitions. These comprise not only private undertakings, but state port authorities such as the Port of Singapore Authority, which set up a business division in 1996 to seek concessions outside of Singapore. At the end of 2001, some 37% of the containers moved through the world's ports were handled at independent terminals (De Souza Jnr, Boresford & Pettit, 2003).

The largest international container terminal operator is Hutchinson Whampoa Ltd and subsidiaries, followed by P&O Ports, SSA, CSX World Terminals, PSA Corporation and Eurogate (De Souza *et al.* 2003). These terminal operators are all profit-orientated and constitute third party service providers in supply chains. In contrast, the dedicated container terminals mentioned in the previous section would be incorporated as cost centres into container supply chains. However, it should be mentioned that APM-terminals which was established to operate the terminals of A.P. Moller, owner of Maersk and Safmarine, and function originally as a cost centre, is now functioning as a profit centre (De Souza *et al.* 2003). However, where a terminal operated by a liner shipping company or subsidiary and its throughput is dedicated to the business of the parent company, its operation as a cost or profit centre would be an internal arrangement and not influence competition with rival supply chains. For example, should the terminal in the Port of Ngqura be dedicated to the traffic of the liner shipping company which acquires the concession to operate the terminal, it would function as a link in an integrated container supply chain, the performance of which would not be subject to the costing or pricing of services provided by a third party.

7.16 Feasibility of supply chain integration

In this section, the feasibility of the further integration of the maritime supply chains described in Chapter Four and the structuring of new integrated chains is examined, in the light of the discussion in the previous sections of this chapter.

Sishen-Saldanha iron ore supply chain

As described in section 4.2.2, the Sishen-Saldanha iron ore supply chain initially incorporated the mine, railways, loading terminal and port in a single scheme financed and operated by ISCOR and it was only as an outcome of its financial failure that the predecessor of Transnet acquired the transport links in the chain. Too much significance cannot be attached to that financial failure as there were other events at the time unrelated to the actual scheme which may have contributed to its unsustainability as a viable project. As the scheme is evidently now profitable for both Kumba Resources and Transnet (see section 4.2.2), its restructuring in a public-private partnership as a single owner would not only ensure that investment in the scheme as an entity is henceforth undertaken where and when needed, but that the viability of all the investment is tested in the world market for iron ore (see section 7.17). That would avoid recurring constraints on throughput because of lack of supply chain capacity similar to the constraint now being experienced. Furthermore, it would ensure that the risk that Transnet undertakes is shared with investors in the world market for iron ore, bearing in mind that Transnet's primary business is the supply of transport capacity for use by the public generally, rather than for a single user whose demand for rail transport needs to be projected with a specialised knowledge of a particular market for world commodities.

Although participation in a joint venture of the nature described with the private sector does not conflict with either the Government's policy for state-owned enterprises or the RDP, relinquishment of the pivotal role in the venture in favour of the leadership by the mining investors might not be acceptable to Transnet in terms of the stated policy of the Government. Furthermore, it would be essential for the venture to have rapid access to the funds to be contributed by Transnet without having to comply with onerous public sector procedures involved in the awarding of tenders and authorisation of expenditure on projects and to have clear non-conflicting objectives relating to commercial performance, leaving redistribution aims to the national government. It is not evident how black economic empowerment could be

achieved through the venture unless the mining enterprise is already sufficiently so empowered or is required as a pre-condition to the venture to ensure such empowerment. The personnel employed in the existing operations of the links in the supply chain would need to be re-employed by the joint venture in order to retain their abilities and experience, but opposition to Transnet's participation in the venture by Transnet's labour unions would surely be encountered if the redeployment had to result in personnel reduction. Apart from these conditions, difficulties of a political and financial nature might be encountered if Transnet wished to invest directly in what should be regarded as primarily a mining venture, though its investment in effect would reflect the value of the existing and upgraded rail and port links in the iron ore supply chain. However, mining ventures of the kind described are really supply chain ventures in which transport and handling costs dominate their viability.

Other methods of developing a "whole chain" scheme similarly to the rival Pilbara iron chain in Australia without selling the rail and port links to the mining company would be to lease or concession those links to the mine owners for a long period and allow improvements to be provided in terms of a BOT-agreement. The lease or concession would need to include the equipment and personnel and be contained in a comprehensive agreement. Such an arrangement would in effect be "near-privatisation" of the entire supply chain and might be unacceptable for that reason to the Government.

Although there are political and financial considerations apart from those explained in sections 3.2 and 3.3 and mentioned in this section that could create complications in any scheme to integrate the links in the iron ore supply chain in any of the manners proposed, perseverance with the existing structure of the chain would risk the recurrence of the current problems with capacity (which have yet to be resolved) and diverge from "best practice" global logistics. The other traffic on the iron ore railway (see section 4.2.2) could be accommodated by providing third party services to the users, which now in effect occurs, or by incorporating their business in the public-private partnership.

The integrated supply chain, as at present, would terminate with the loading of the cargo on board the ships. In sections 6.3 and 7.8 the prospects for extending the chain by delivering c.i.f. in foreign ports are discussed. Australian exporters do so, but although they are price-takers in the charter market for bulk carriers, the phenomenal rise in freight rates in 2004 as a result of the demand for raw materials by China has been to their benefit, quadrupling the historical freight differential between Australian and Brazilian iron ores to Asia (Minerals Council of Australia, 2005). The very recent decline in freight rates (see section 6.3) is having the opposite effect. In order to lessen the effect of such fluctuations in charter rates on sales, some producers of iron ore rely on their own shipping for a proportion of their exports – ISCOR (predecessor to Kumba Resources) entered into a joint venture with Safmarine for that purpose, but the company, Safore (Pty) Ltd, is now owned by Engen Pretroleum (Pty) Ltd, although the ships are still used by Kumba Resources (Who Owns Whom, 2004). The prospects for extending the integration of the iron ore supply chain through the operation of the ships will be enhanced if the current efforts to re-establish a South African shipping industry are successful¹¹⁾.

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An issue that may complicate participation by Transnet in a joint venture with the mining investors is its dependence on the revenue of the National Ports Authority, which operates the Port of Saldanha. In accordance with the analysis in sections 3.2 and 3.3, it is unlikely that the port land and infrastructure used for the iron ore terminal at Saldanha or the marine services for the accommodation of the bulk carriers could be included in the joint venture and the National Ports Authority. Where supply chains for the export of minerals and ores have been privately structured including the port (for example, the Pilbara ore chain in Australia), marine services, including channel dredging, navigation aids, pilotage and tug assistance, constitute an integral link both physically and financially in the chain. The Sishen-Saldanha iron ore chain was originally so structured by ISCOR, which was an autonomous state-owned enterprise (see section 4.2.2). Some mineral supply chains incorporate privately provided berths and marine services within an

existing harbour¹²). Apart from the privately-owned off-shore mooring buoy for the off-loading of oil imports within the port limits at Durban (National Ports Authority of South Africa, 2004), marine infrastructure and services in South African ports are provided by the National Ports Authority and that will continue in accordance with National Ports Authority Act, 2005, as explained in section 3.2 and 7.8. The National Ports Authority will consequently constitute a third party service provider in the proposed restructured ore supply chain. While that Authority remains a division of Transnet and its charges are not subject to appeal, Transnet's participation in the proposed joint venture might be anomalous, as those charges would influence the viability of the venture. The problem will no longer exist if and when the National Ports Authority becomes autonomous as envisaged in the Act (Act 12 of 2005) governing its establishment.

Although none of the issues raised in this section seems to involve insurmountable difficulties that would preclude the restructuring of the Sishen-Saldanha iron ore supply chain as a partnership between Transnet and the mining companies in the international market for iron ore, chain leadership dedicated to such restructuring is essential (see section 7.12). The outcome, if successful, would contribute to the efforts of the Government to achieve a 6% annual growth in the economy by enabling the supply chain to compete more successfully in the world market for iron ore.

Mpumulanga – Richards Bay Coal line

The restructuring of the maritime supply chain for coal from Mpumulanga to Richards Bay involves issues similar to those dealt with in the previous section. A public-private partnership with Transnet would need to include several mine owners, but their participation would be facilitated by their existing joint venture in the privately-operated Richards Bay Coal Terminal¹³). The expansion of the private venture in Richards Bay Coal Terminal to include Transnet's investment in the Coal line in a public-private partnership coal export scheme is feasible, in principle, although the manner in which the

amalgamation could be accommodated in the individual markets of the coal producers in which long-term supply contracts exist is not known and is not an issue that can be researched in this thesis. The anomaly remains that the National Ports Authority (as a third party service provider monopolising the supply of port infrastructure and marine services and receiving royalties from the Richards Bay Coal Terminal) is also a division of Transnet. Nevertheless, the integration of the production of the coal and the supply chain for the export of the coal will create a more competitive “whole supply chain” and decrease the f.o.b. price at which the coal can be sold by reducing the costs of rail transport and eliminating the profits for Spoornet presently incorporated in the costing of that price. That can be derived from the acknowledgement by Transnet that the Coal line is one of the major sources of profit for Spoornet in contrast to many other rail services that are unprofitable and the admission that rail costs are some one third higher than could be achieved through efficient private operations (Merit, 2002b). The investment by Transnet in the public-private partnership would be equivalent to the amount of its investment in the existing and upgraded rail operation and the return on the investment would replace its net earnings on the present rail operation. There is no obvious reason why that return should be less than those earnings as both depend upon the f.o.b. price of the coal, which determines the quantity sold. In fact, the return is likely to be larger as the demand for the coal is price elastic and more coal could be sold at a lower f.o.b. price. The greater volume of exports would contribute to a rise in national economic growth. As the tonnage of coal exported annually is currently 68 million tonnes (Hutson, 2005e:6) and is valued at approximately R3.4bn (Faniso, 2005b), it is obvious that an increase in that tonnage would have significant economic benefits.

Current plans provide for the expansion of the throughput of the terminal by 21% to 86 million tonnes of coal by 2008 (Bailey, 2005), which will exceed the present throughput amounting to approximately 82 million tonnes of the coal terminal in the Australian Port of Newcastle, which is claimed to be the largest in the world. However, the capacity of that terminal will be expanded to 102 million tonnes by 2007 (Minerals Council of Australia, 2005). As an outcome of recent black empowerment in the South African coal mining industry in

accordance with new mining legislation, it is anticipated that the current plans for the expansion of the capacity of the Richards Bay Coal Terminal might be inadequate and that capacity for a throughput also of 102 million tonnes will be needed by 2008 (Bailey, 2005). The current expansion requires Transnet to spend R2,5 billion on upgrading the railway and R1,2 billion on upgrading the port and providing an additional berth (Pradeep Moharaj, Head of Strategy, Transnet as quoted by Bailey, 2005). If the throughput is to reach 102 million tonnes, much more will need to be spent on upgrading, the risk of which depends on the world market for coal and the f.o.b price at which South Africa can meet the demand, as well as the judgment of the mining investors.

Sale of Transnet's assets in iron ore and coal supply chains

The public-private partnerships proposed in the preceding sections would not constitute privatisation in the rigorous meaning of that term, but would ensure that Transnet's expectations from its investment in the schemes and the risks correspond with the expectations and risks of the investors in the mines. The sale of Transnet's assets in those schemes was among the intentions of the original proposals for the privatisation of state assets (Pojie & Davids, 2002:53) in order to avoid the risk of expanding the capacity of the railways for traffic dependent on the demand for commodities in single markets. However, the privatisation proposals were eventually rejected for reasons, among others, that the purchase of the assets by the private sector would amount to "cherry picking" (see [section 3.3](#)).

Container supply chains

Important issues in the structural integration of container supply chains are whether the volume of containers handled in South Africa by any of the liner companies likely to lead such development is adequate to justify the incorporation of their own port terminals in the chains and whether such terminals could be accommodated in the ports. As mentioned in [section 4.4](#),

the capacity of a container berth is a throughput of between 150 000 and 250 000 TEU per annum (Merit, 2001). At an initial utilisation of 50%, throughput of approximately 400 000 TEUs per annum would be sufficient to justify the operation of a private two-berth terminal, provided adequate growth in the volume was assured (Merit, 2002b). At least two of the liner companies serving South Africa (MSC and Safmarine/Maersk) handle volumes currently in excess of 400 000 TEUs annually and are experiencing growth in excess of 5% per annum¹⁴⁾. All three of the existing container terminals in South African ports are available for common use and plans are being implemented for the expansion of the terminals at Cape Town and Durban. In none of the three ports with container terminals could provision be made under existing circumstances for additional terminals except at great expense and subject to environmental approval that might be difficult to obtain¹⁵⁾. A new container terminal could feasibly be constructed in the Port of Richards Bay, but the location of the port is logistical unsuitable for container traffic between Europe and South Africa (Fourie & Van Niekerk, 2002), while traffic between the Far East and ports south of Durban would then need to be transshipped to coastal vessels as the volumes would not justify the extension of voyages beyond Durban. The new Port of Ngqura at Coega, for which no traffic has as yet been identified, will be equipped with a container terminal (Ramos, 2005) by 2007. Although the port is further than Durban from Gauteng, which is the origin and destination of most of the containers moving to and from South Africa, it has some logistical advantages for liner companies. Container ships on voyages from Europe could be turned around at the port if it served as the port of entry for Gauteng traffic, while large ships from the Far East could use either Ngqura or Durban for cargo to and from Gauteng and local cargo, calling at the alternative port on either the forward or return voyages for local cargo. Cargo to and from Cape Town, South America and East and West Africa could be transshipped at Ngqura, which could be developed as a hub port according to Alan Jones, CEO of Safmarine Africa (Hutson, 2005c:15).

The Port of Ngqura was initially conceived and built to accommodate bulk shipping for factories that were being planned for location at Coega, but when those plans failed to materialise other uses were envisaged. The prospect of

the establishment of an aluminum smelter at the port has been ongoing for some years, but the port traffic that its existence would bring is well below the volume needed to sustain the viability of the port (Richardson, 2005c). In 2000, P&O Nedlloyd was awarded preferred partner status by the Coega Development Corporation to construct and operate a container terminal, but after the responsibility for concluding the contract was changed to the National Ports Authority, as a division of Transnet, negotiations were “frustrated” (New, n.d.) and subsequently the preferred status of P&O Nedlloyd was withdrawn¹⁶⁾. In 2001, the economic justification for developing a container terminal in the Port of Ngqura to serve Gauteng instead of expanding the existing terminal at Durban was motivated in a comprehensive report (Merit, 2001) and in May 2002 the logistical and financial feasibility of improving the railway between Coega and Gauteng for the purpose of the private participation by a terminal operator in the railway container business was explored (Merit, 2002b). All the aspects dealt with in those two studies cannot be described in the thesis, except to repeat the conclusions that the establishment of a container terminal in the Port of Ngqura in place of the expansion of the terminal at Durban, and the improvement of the railway between Coega and Gauteng in order to permit the operation of private container trains, are economically justified propositions (Merit, 2002b). The latter proposal involves several options, the most feasible of which in accordance with world best practice is the establishment of a private logistics company to construct the container terminal in terms of a BOT-agreement as well as to operate container trains between Coega and Gauteng. Instead of using the City Deep inland container terminal in Gauteng, the company would construct and operate its own terminal. Substantial improvements to the railways infrastructure between Coega and Gauteng are needed to enable fast rail transport¹⁷⁾ and the requisite funding could be provided by a public-private partnership between Transnet and the logistics company. The partnership would become the owner of the track and lease slots in train schedules to private train operators. The private logistics company would be the main user on most sections of the railway, while Spoornet, as a division of Transnet, would be another user. The private operation of the trains is considered to be essential as it is estimated that “the service could be privately operated at 65%

of the costs that would be taken into account if Spoornet functioned as the trains operator” (Merit, 2002a), while the ringfencing of the ownership of the rail track through a public-private partnership is considered to be necessary in order to avoid the cost legacies presently burdening Transnet. The intricacies of the proposed arrangements concerning the rail track and the avoidance of the imposition of extraneous costs is not a topic that needs to be included in this thesis, except to mention that there are formidable if not insurmountable difficulties involved.

The benefits of the proposal are that the logistics company which could be a liner operator, would have complete control over the international movement of cargo from door-to-door as well as the repositioning of containers and be able to manage the supply chain costs efficiently. Transnet would be relieved of capital expenditure on a container terminal in the Port of Ngqura and some of the expenditure on improving the rail infrastructure between Coega and Gauteng as well as some of the capital expenditure on the Port of Durban and railway between Durban and Gauteng, which is essential in the long term if Durban remains the container port for Gauteng traffic. Customers would benefit from the lower generalised costs of the container services and the competition between the liner company or companies using the private terminal in the Port of Ngqura and the companies using the public terminal in the Port of Durban. With the takeover of P&O Nedlloyd by AP Moller (Maersk) of Denmark (see [section 6.4](#)), Safmarine which is owned by Maersk would seem to be the logical concessionaire of the container terminal and rail operation. However, a joint venture between several liner companies similar to that of the ERS (see [section 5.3](#)) is conceivable (see [section 7.13](#)).

Several projections have been made of the container traffic through the proposed container terminal in the Port of Ngqura. If the terminal serves traffic between the West (countries on routes west of Coega) and replaces that terminal in Durban in that function, some 450 000 equivalent TEUs carrying cargo could feasibly be handled in 2007 rising to 826 000 in 2020. A more realistic projection is 280 000 equivalent TEUs carrying cargo in 2007 rising to 669 000 in 2020, as not all Gauteng traffic to and from the West will be

diverted (Merit, 2002a:104). In these projections the assumption has been made that empty containers will be moved to Cape Town as at present, but that is not certain as the logistics of moving empty containers are treated as confidential by the liner companies¹⁸⁾. Based on the throughput of only loaded containers and ignoring the ratio between 20 and 40 foot containers, capacity will be required on average per day for between 25 and 16 trains carrying 50 containers each in both directions in 2007 on the railways between Coega and Gauteng. Allowing for some empties and an imbalance in the directional flows as well as seasonal variations, the required capacity should be increased by some 60%, indicating that the capacity should be able to accommodate bi-directional traffic of at least 40 trains or 20 trains daily in each direction in 2007. The requirement in 2020, similarly calculated, will be 37 trains in each direction. If the trains are increased in length to 100 equivalent TEUs, which is feasible through upgrading, capacity in 2007 for 10 trains and 2020 for 19 trains in each direction per day should be adequate. In accordance with the usual assumptions when estimating the requirements for rail capacity, maximum utilisation should be estimated at 80% of the capacity needed. Thus the maximum capacity for which provision needed be made is 25 trains in each direction in 2007 and 46 trains in 2020, but this could be halved if 100 container trains are operated. As shown in Table 4.6, the existing line capacity is adequate.

If the container terminal is concessioned to a liner shipping company for its own traffic, the number of containers handled will be considerably less although that will depend upon whether the company uses the terminal as a hub for the transshipment of traffic between routes to the West of the port and to the East (Hutson, 2005c:15), which is likely and, of course, the identity of the liner shipping company involved¹⁹⁾ (Merit, 2002b). If the terminal is concessioned to a consortium of liner operators, the throughput estimated in the previous paragraph could be reached.

Although the private operation of container trains between Durban and Gauteng also seems to be a proposition in line with global trends, it is unlikely that the Government would consider concessioning the existing common user

container terminal in the Port of Durban to a liner company, but would insist on an entirely independent concessionaire²⁰). Should it be feasible to make provision for a second container terminal at Durban that could be concessioned in terms of a BOT scheme²¹), there seems to be no reason why a liner company should be excluded, especially as the terminal would compete with the public terminal for custom through the liner services. Several liner companies could then be allocated slots on the Durban-Gauteng railway to operate their own trains. Commissioning a common user container terminal in the Port of Ngqura would then not make sense, as the terminal in the Port of Port Elizabeth is adequate for local container traffic (Merit, 2001), i.e. additional common user terminals are not required if the demand for the use of the common user terminal in the Port of Durban is relieved through the concessioning of private terminals (dedicated container terminals).

If the development proposed in this section could be brought about, South Africa could be served by a network of just-in-time door-to-door container services under the control of rival liner companies and benefit from the effect of competition on the pricing and quality of the services.

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Fruit chain

Little need be said about the fruit chains, which are under the control of organisations responsible for the movement of the fruit from growers to wholesalers overseas as described in section 4.5. The chains function in effect as integrated chains and achieve their purpose in a competitive market. Further integration could be achieved through the incorporation of privately-operated rail services that could enable growers more distant than those served by road transport to be included in the market of the existing chains. Mention is made in section 4.5 of the attempt to export avocados grown in Mpumalanga through Cape Town, using rail transport, which was discontinued because of the difficulty in adhering to schedules. Slots in train schedules guaranteeing punctuality of access to line sections, if feasible, would enable such rail services to be integrated into the fruit chain.

Fresh Produce Terminals, which is a subsidiary of Capespan, has recently entered into BEE-transactions whereby three partners acquire 26% of the firm (Perishables, August 2005:15). The transactions have been necessary in order to comply with the requirements of Transnet, which is the landlord of the fruit terminals in the ports of Cape Town, Port Elizabeth and Durban, through the National Ports Authority.

7.17 Models of supply chain restructuring

In Tables 7.1 and 7.2, the structures of the supply chains described in Chapter Four are compared with the more efficient structures discussed and proposed in section 7.13.

Table 7.1 shows in separate columns the chains of the main assets and chains of main operations in the Sishen-Saldanha iron ore supply chain (Model 1a) and the Mpumulanga – Richards Bay Coal line (Model 1b). The table also compares the structures of these chains with those of Model 2, which provides for link integration through public-private partnerships and Model 3, which would be tantamount to privatisation in the rigorous sense of the term. As indicated, Model 2 provides for the ownership of the supply chain including the mine to the loading of the cargo on board ships, by a public-private partnership, but excludes ownership of the rail and port land and the port infrastructure. The partnership would thus operate the entire chain with Transnet and the NPA (when it becomes autonomous) as third party service providers, to the extent that they would let the right-of-way for the railways and the port land and infrastructure to the partnership and the NPA would supply marine services. The public-private partnership could also undertake the ancillary shipping services if deficiencies in the delivery of those services tend to impair the smooth functioning of the chains.

Although the supply of marine services is a task reserved for the National Ports Authority in terms of the National Ports Authority Act, 2005 (Act 12 of

2005), provision is made in the Act for those services (for example, pilotage, tug assistance, mooring and dredging) to be concessioned to private enterprise. Marine services could thus be incorporated eventually in the public-private partnerships envisioned for the ownership and operation of supply chains for bulk exports in order to further their integration, but that could conflict with the declared intention of the Government to involve small to medium black-empowered enterprises in basic port activities. The involvement of those enterprises would create additional profit-seeking third party service providers as links in the chain, whereas the integration of a chain under the leadership of a public-private partnership is intended to eliminate such service providers in the interests of overall chain efficiency.

The structure of Model 3 is not feasible in terms of the present policy of the Government and is shown merely for the purpose of comparison with Model 2, the main difference being the substitution of public-private partnerships for entirely private undertakings. However, public-private partnerships as proposed in the table will function as private enterprises if the chain leadership is entrusted to the investors in the mines in accordance with the motivation in the previous section.



The existing structures and proposed alternative to the main container supply chains in South Africa are illustrated in [Table 7.2](#). In accordance with the intentions of the Government set out in the National Freight Logistics Strategy (2005), state ownership of the land used for ports, railways and roads and the port infrastructure and terminals is retained in all the models, but provision is made for rail infrastructure to be owned by a public-private partnership. That would apply to the railway between Coega and Gauteng, which needs to be upgraded if the proposed container terminal in the Port of Ngqura is to serve Gauteng, as a likely public-private participation project. Model 2 shows the structure of a container supply chain integrated under the leadership of a liner shipping company, which would have control over the entire chain, subject to third party intervention only by rail and port landlords. It needs to be noted, however, that while rentals for land can be determined at market prices and thus not affect the cost-efficiency of the chain, the charges for the use of the

basic port infrastructure can do so²²⁾. Thus port and cargo dues imposed by the National Ports Authority and currently used to subsidise the other enterprises of Transnet are tantamount to external costs that affect the international competitiveness of the chain.

Examples of the successful integration of container supply chain networks are the European Rail Shuttle (ERS), described in [section 5.3](#), which distributes containers through the Port of Rotterdam to and from places in Europe and BoxXpress, which is partly owned by ERS and does likewise through the ports of Bremerhaven and Hamburg. While those services, which include integrated container terminals, the operation of container trains and deliveries of containers by road transport, convey mainly the traffic of their shareholders, traffic is also carried for third parties. The advantage of that arrangement, which would also be necessary if similar integrated container supply chains are structured in South Africa, is that rail capacity on scheduled trains can then be sold at spot prices when ships are delayed and intermodal coordination is disrupted. The arrangement, if allowed in South Africa, implies that the container operator would offer limited (i.e. limited to spot use) common user services in competition with Spoornet, and could do so at marginal cost, which is conceptually a cause of concern for the latter²³⁾, but is acceptable in Europe because of the competition and efficiency that it promotes.

There can be no doubt that the landside integration of container supply chains at the South African end of international routes will have to come about if the South African manufacturers are to raise or at least retain their ability to compete with foreign manufacturers. The benefits for South Africa if reliable just-in-time scheduled container services in contrast to the present system of distribution, which often involves uncertain delivery times and requires the tracking of containers to ascertain the progress of the movement, are undisputable (also [see section 7.19.1](#)).

Table 7.1: Existing and alternative structures of South Africa’s major supply chains for the export of minerals and ores

Link description	Existing structures				Alternative structures			
	Model 1a		Model 1b		Model 2		Model 3	
	Asset owners	Operators ¹⁾	Asset owners	Operators ¹⁾	Asset owners	Operators ¹⁾	Asset owners	Operators ¹⁾
Mines: land loading appliances	Private firms Private firms	Private firms Private firms	Private firms Private firms	Private firms Private firms	PPP ²⁾ PPP	PPP PPP	Private firms Private firms	Private firms Private firms
Railway: land infrastructure equipment	Transnet Transnet Transnet	Spoornet Spoornet Spoornet	Transnet Transnet Transnet	Spoornet Spoornet Spoornet	Transnet PPP PPP	Transnet PPP PPP	Private firms Private firms Private firms	Private firms Private firms Private firms
Port: land terminal infrastructure	NPA ³⁾ NPA NPA	NPA SAPO ⁴⁾ NPA	NPA Private firms NPA	NPA Private firms NPA	NPA PPP NPA	NPA PPP NPA ⁵⁾	NPA Private firms NPA	NPA Private firms Private firms
Ships	Shipowner	Foreign importer	Shipowner	Foreign importer	Shipowner	PPP ⁷⁾	Shipowner	Private firms ¹¹⁾
Ancillary shipping services⁶⁾	Private firms	Private firms	Private firms	Private firms	PPP	PPP	Private firms	Private firms

Source: Compiled by the author for the purpose of the study.

Notes:

Model 1a: Sishen - Saldanha iron ore chain

Model 1b: Mpumulanga - Richards Bay Coal line

Model 2: Proposed link integration through public-private partnerships

Model 3: Privatisation (in practice)

1) Operators include managers in this table

2) PPP: Public-private partnership

3) Presently Transnet, of which the NPA is a division - in terms of Act 12/2005, the NPA will eventually become an autonomous body

4) SAPO: South African Port Operations, division of Transnet

5) Marine services (i.e.tug assistance, pilotage, mooring) - could be provided by private undertakings

6) Ships agency, chandling, forwarding, documentation, shiprepair

7) As charterers

Legend:	
State enterprise	
Private enterprise*	
Foreign participant	

*Public-private partnerships are regarded as private enterprise

Table 7.2: Existing and an alternative structures of South Africa's major container supply chains

Link description	Existing structures				Alternative structure	
	Model 1a		Model 1b		Model 2	
	Asset owners	Operators ¹⁾	Asset owners	Operators ¹⁾	Asset owners	Operators ¹⁾
Consignors: suppliers forwarders	Private firms	Private firms	Private firms	Private firms	Private firms	Private firms
	Private firms	Private firms	Marketeer	Marketeer	LSC	LSC
Inland terminal: land infrastructure	Transnet	Transnet	n.a.	n.a.	LSC	LSC
	Transnet	SAPO ²⁾			LSC	LSC
Railway: land infrastructure equipment	Transnet	Transnet	n.a.	n.a.	Transnet	Transnet
	Transnet	Spoornet			PPP ³⁾	PPP
	Transnet	Spoornet			LSC	LSC
Road: infrastructure vehicles	State	Government bodies ⁴⁾	State	Government bodies	State	Government bodies
	Private firms	Private firms	Private firms	Marketeer ⁵⁾	LSC	LSC
Port: land terminal infrastructure	NPA ⁶⁾	NPA	NPA	NPA	NPA	NPA
	NPA	SAPO	NPA	Marketeer	NPA	LSC
	NPA	NPA	NPA	NPA	NPA	NPA ⁷⁾
Ships	LSC	LSC	LSC	Marketeer ⁸⁾	LSC	LSC
				LSC ⁹⁾	LSC	LSC
Ancillary shipping services¹⁰⁾	Private firms	Private firms	Private firms	Private firms	LSC	LSC

Source: Compiled by the author for the purpose of the study.

Notes:

Model 1a: City Deep - Durban corridor (example)

Model 1b: Fresh fruit supply chain

Model 2: Liner shipping company (LSC), as chain leader

1) Operators include managers in this table

2) SAPO: South African Port Operations, division of Transnet

3) PPP: Public-private partnership between Transnet and LSC

4) or toll road concessionaires

5) Hirer

6) NPA: Presently Transnet, of which the NPA is a division - in terms of Act 12/2005 the NPA will eventually become an autonomous body

7) Marine services (i.e.tug assistance, pilotage, mooring) - could be provided by private undertakings

8) Charterer of refrigerated ships

9) Cargo shipped on liners

10) Ships agency, chandling, forwarding, documentation, shiprepair

Legend:	
State enterprise	
Private enterprise*	
Foreign LSC	

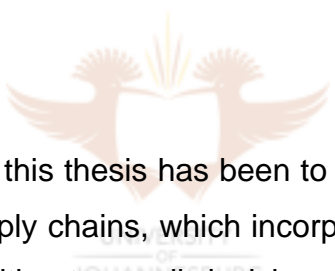
*Includes PPP's and other private enterprises

7.18 Land ownership

So far land ownership has not been mentioned as Transnet and eventually the National Ports Authority as a separate state enterprise will remain the landlords for the infrastructure on which the railways and ports structures are built. As long as the rentals charged are equivalent to the opportunity costs of the land or at least are market-related, the effect on the costs of the proposed integrated supply chains shown in the preceding section will not differ from the costs of ownership of the land, but obviously the landlord functions will need to be ring-fenced from the public-private partnerships into which Transnet enters.

7.19 Benefits of maritime supply chain restructuring

7.19.1 Basis for benefits



The general thrust in this thesis has been to show that the structures of South Africa's maritime supply chains, which incorporate links provided by State and private enterprises without overall decision-making leadership, do not enable their vertical integration to match the efficient structures of rival chains in international markets. Rail and port links are currently underperforming because investment in capacity has been neglected during the past two decades and the morale of the personnel is low (National Department of Transport, 2005:42). Although Transnet has promised substantial new investment in infrastructure and equipment (i.e. R40bn) (Smuts, 2005a:8) over the next five or more years, that does not necessarily guarantee the development of efficient and seamless (i.e. seamless at interfaces) supply chains for imports and exports, nor does it ensure that their capacity and performance will henceforth match the demand, because Transnet's management has acknowledged that the investment will serve as a "band-aid" for existing problems rather than provide for traffic growth (Smuts, 2005a:8). Furthermore, no promises have been made in the announcements concerning new investment for that to be accompanied by chain leadership that will

advance the restructuring of the links in maritime supply chains to ensure the seamless flow of cargo under single management.

In the meantime South Africa's economic growth is being retarded by the supply chain deficiencies, which are manifest in unnecessarily large stockpiles and inventories and high generalised transport costs²⁴). If the target growth of 6% per annum in the Gross Domestic Product is to be attained (Visser, 2005:s14) in accordance with Government planning, more innovative measures than the perennial management restructuring of Transnet with promises of new investment in infrastructure and improved performance are needed. The solution does not lie in further planning (see endnote 27) or privatisation in the rigorous meaning of the term, because there is little or no scientific analysis or empirical evidence to show that the privatisation of state assets cures the lack of productivity in their utilisation (Ramos, 2005). Nor is there much proof that the benefits of privatisation accrue to third party users (Morgan, 2001). The solution lies rather in the integration of the links in maritime supply chains in order to avoid the dependence of their efficiency on the performance of third party service providers, who may be motivated by their own profit-seeking or extraneous aims and are tolerant of their own inefficiencies, rather than by the fundamental purpose of the supply chains. Such integration can come about only through chain leadership that identifies directly with that purpose.

The solutions to the current problems with South African maritime supply chain performance proposed in this thesis differ from the resort to privatisation, as such. Users of the bulk export chains will not be third parties dependent upon Transnet's investment acumen and operational performance, but investors responsible for such investment and performance themselves and the bearers of the risks. While the users of the container supply chains will remain third parties, the essential feature of the proposals is the creation of competition between the services of liner shipping companies managing and operating entire supply chains from door-to-door and the services of container operators relying on the capacities and performances of the common-user facilities provided by divisions of Transnet. In that manner the rigor of the market will

permeate the service delivery of Transnet and eliminate the inefficiencies of its current monopoly of container handling in the ports. State participation in the investment in entire bulk supply chains should ensure that the resources are not exploited regardless of the environmental consequences and the opportunities for beneficiation, and will result in a return on the investment that can be applied in the interests of the welfare of the population, preferably in the vicinity of the mining operations and supply chain routes. State participation in the container supply chains will be limited to investment in the partnership responsible for the provision of rail infrastructure and the land on which the railways and port container terminals are situated. That, together with competition between supply chain services, will be sufficient to preclude private monopolies evolving through mergers or alliances, although the Competition Commission will need to be alert to the local effects of international trends in the container shipping industry, which are moving to a concentration of ownership (see [section 6.4](#)). As shown in [Table 6.5](#), Maersk will operate some 452 ships with a slot capacity of 1 499 916 TEUs through the merger with P&O Nedlloyd currently in progress, against the next largest operator in the industry (MSC) with some 257 ships and 681 334 slots.

Implementation of the proposals will result in many benefits which are outlined separately for bulk and container supply chains.

7.19.2 Benefits – bulk supply chains

Investment linked to market demand

The incorporation of public-private partnerships to own and manage South Africa's major export supply chains of bulk commodities will link investment in their capacities directly to the projected demand in international markets. In particular, investment in increments in those capacities will be adaptable to sales targets. The risks of the investment will be borne by the partnership instead of by public undertakings and the State's commitment will be limited to

the amount of its shareholding. In accordance with the present structuring of the supply chains, Transnet is dependent upon the users of the rail and port infrastructure and equipment to furnish projections of the demand and must rely on guarantees that the traffic will materialise when the capacity has been provided. When unequivocal guarantees are not forthcoming or provision needs to be made for common use about which there is uncertainty, reluctance by Transnet to respond to anticipated demand is understandable, but there can be no doubt that its risk aversion during the past two decades is currently to the detriment of the economy (see [section 3.2](#)) as evidenced by the investment backlog of some R50bn (Smuts, 2005a:8). For example, BHP Billiton has estimated that some R1.5bn has been lost in foreign exchange because of the lack of rail capacity to export coal (Smith, 2005:16). The sharing of the risks of investment in capacity with the producers of bulk exports should resolve that problem.

Black economic empowerment

The formation of public-private partnerships will create opportunities for black investors in resource exploitation to participate in the ownership and management of the maritime supply chains and obviate “crowding-out” by large producers (see [section 7.13](#)). Some open-endedness in the shareholding with rights of use should enable cartelisation by the supply chain owners to be precluded and ensure equity of access to the facilities for new producers. As the Government will also participate in the partnership, its share can also be subject to adjustment in order to admit black entrepreneurs.

Productivity

The elimination of third party service providers in the bulk export chains and the integration of the management of the links aimed at achieving the single purpose of the chain will enable costs to be saved through rationalisation, but mainly through the co-ordination of scale economies as the capacities of the links are enlarged. Higher productivity will enable the f.o.b. prices of the

products to be lowered and raise their demand in the market. In accordance with the current shipbuilding cycle, more bulk carriers will enter service in 2006 than the immediate demand requires and that is likely to depress freight rates below their current high levels (Platou, 2005). That will also reduce the comparative cost advantage of Australian suppliers in the Chinese markets and afford opportunities for South African producers to raise their market shares. While Transnet's promise of new investment in capacity will not be realised by then, contracts for supply are often concluded long in advance of delivery and the establishment of integrated supply chains under single ownership will enable negotiations to proceed with the assurance of delivery on time.

Model for development

South Africa's reserves of ores and minerals are far in excess of what can be beneficiated and it will remain a major exporter of raw materials for the foreseeable future, provided its supply chains are able to compete internationally. Their distances of haul results in a fundamental cost disadvantage, but to some extent that can be overcome by technological innovation and organisation, which is the purpose of the proposed restructuring. If implemented, the restructuring will establish a model for the development of similar chains in the future. The model will accord with world best practice and the experience gained in its application should enable South Africa to remain in the forefront of bulk supply chain development.

Macro-economic benefits

Although the beneficiation of raw materials should undoubtedly receive priority in the strategy for achieving higher rates of economic growth in South Africa, exports of commodities will remain a major source of foreign earnings for many years to come. As the yield (through the multiplier) is reflected in the Gross Domestic Product *per capita*, commodity exports contribute directly to economic growth. That warrants the structuring of efficient and seamless bulk export supply chains capable of achieving comparative cost advantages in

world markets. The Minerals Council of Australia has identified the complexity and fragmentation caused by a range of public and private organisations along the transport route as the real bottleneck to promoting economic growth through exports of raw materials. A similar situation pertains in South Africa, but the proposed restructuring will largely eliminate such bottlenecks.

Current State intervention

The effect of the establishment of public-private partnerships to own and manage the entire bulk supply chains will remove direct state intervention in the transport and handling of the products in favour of indirect participation through investment, on which a return will be earned for re-distribution and the promotion of equity and welfare. Except insofar as the investment in genuine infant industries is warranted, especially in developing regions, there is no macro-economic reason why the Government should be directly involved in bulk export supply chains. Its indirect participation in a public-private partnership would stem from the historic role of Transnet, but in accordance with the recently announced National Freight Logistics Strategy, that role needs to change. The proposed restructuring gives effect to such changes in a manner that is privately and publicly beneficial.

7.19.3 Container supply chains

Port of Ngqura – Gauteng container supply chain

The concessioning of a container terminal in the Port of Ngqura through a BOT-agreement with a liner shipping company, the improvement of the rail infrastructure between Coega and Gauteng through a public-private partnership and the grant of rail access enabling the operation of container trains by the liner shipping company, will enable substantial expenditure on improvements to the container handling capacity in the Port of Durban to be avoided by the National Ports Authority. It will enable an efficient seamless

door-to-door just-in-time service to be instituted by the liner company, which through competition with the operators of container services relying on the existing common-user port and rail facilities, will raise their efficiency. The basis of the competition will be the time-saving and punctuality in container distribution that will enable the inventories of dealers to be reduced, with savings in the associated costs. That will stimulate economic growth and free-up capital for other investment, which is highly desirable in South Africa, in view of the current low rate of private savings. It will also create a major role for the new Port of Ngqura in which Transnet has invested substantial capital and will contribute to the economic and financial viability of the port.

Port of Durban – Gauteng container supply chain

The Port of Ngqura – Gauteng container supply chain will constitute a model for similar development when other opportunities arise. For example, if Salisbury Island in the Port of Durban, formerly occupied by the South African Navy, becomes available for the development of a container terminal, that could also be concessioned in terms of a BOT-agreement for private use and the concessionaire could be granted access to the rail infrastructure between Durban and Gauteng in order to operate private container trains, so creating additional competition in the market for container services.

Transport cost savings

These schemes will exploit the competitive cost advantages of rail over road transport over the distances of haul between Coega and Gauteng and Durban and Gauteng and so reduce transport costs (see [Figure 2.5](#)), which is regarded as imperative if higher economic growth rates are to be achieved in South Africa. In principle, rail transport efficiently operated, is capable of providing scheduled just-in-time services between the ports and major industrial centres in the interior of the country with greater reliability and safety than road transport, which does not have the advantage of a reserved right-of

way, and at lower cost because of its economies of scale. The savings that could so be realised, as reflected in saving in freight charges, inventory costs and insurance would contribute substantially to the profitability of commerce in South Africa and lead to further enterprise and job creation. The restoration of the rightful role of rail transport will also have economic benefits in the form of savings in road maintenance expenditure (National Department of Transport, 2005).

In particular, an improved railway for rapid services between Coega and Gauteng will result in container traffic moving back to rail transport from road transport and also bring savings in the costs of road accidents, road building and traffic congestion. Large volumes of container traffic between Coega and Gauteng will also strengthen that corridor in compliance with the National Freight Logistics Study.



The structuring of integrated container supply chains operated by liner shipping companies through instrumentation by the Government will enable conditions for concessions to be imposed that will facilitate black economic empowerment. As the leading investors in the schemes will be liner shipping companies operating internationally, black participants in the schemes can be included in the corporate structure of multi-national undertakings through local subsidiaries, which will enable skills transfer in international maritime investment. In view of the difficulty that black entrepreneurs currently experience with entry into the maritime industry, concessions by the Government enabling the vertical integration of landside container links into the marine business of the liner companies will provide opportunities to negotiate black participation. As a consequence of the condition imposed by the European Commission for the sale of P&O Nedlloyd to Maersk²⁵⁾, opportunities have arisen for a consortium comprising South African and foreign companies to take over the routes operated by Maersk between South Africa and Europe. That consortium, which is likely to include black

empowered firms, could also be a candidate for concessions to operate the proposed Port of Ngqura – Gauteng container supply chain.

Reduction in inventory costs

Seamless door-to-door just-in-time container supply chains have substantial advantages for both importers and exporters as they enable inventories to be kept to a minimum and so reduce the cost of working capital. Furthermore, they enable suppliers to avoid the cost of stock rendered redundant by unexpected changes in consumer preferences and to adapt more rapidly to fluctuations in market demand. The benefits stemming from reliable and punctual deliveries of supplies, in contrast to the uncertainties caused by the delays to containers at ports and in-transit, currently experienced by importers, will be large and will bring down consumer prices. In general, the effect of the improved services will be anti-inflationary. Exporters of manufactured goods will be able to count on just-in-time delivery of their goods, which will add to their marketability. The fruit chain which currently functions efficiently affords an example of what can be achieved.

Security

The operation of fully-integrated container supply chains by a liner shipping company providing services for the movement of cargo, including the marine link, from shipper to the recipient, and transshipment on route eliminates many of the problems experienced at interfaces as a result of differences in the application of the ISPS-Code. As the cargo and the requisite documentation remain in the possession of the liner company throughout the transit of the containers, opportunities for malicious intervention are limited and security is enhanced. That not only constitutes an advantage in itself, but delays in transit as a result of the security requirements of the ISPS-Code are avoided and the reliability and punctuality of the delivery of the containers become more assured.

Possession of containers by a single operator throughout the journeys of the containers also enhances the security of the contents for customers. Wastage through thefts and damage resulting from careless handling is reduced, which results in savings in insurance costs.

Potential impact on the GDP

As the maritime supply chain structuring motivated in this thesis is not a finite proposition, but should institute an ongoing process that enables South African supply chains to compete more successfully with the chains of its rivals in international trade, the effect on the GDP cannot really be quantified. Freight transport costs in South Africa are estimated to be some 75% too high (CSIR, 2005). While the improvement of maritime supply chain efficiency will reduce those costs and thus the contribution of the sector to the GDP (which is currently 14.7% or R180bn), lower transport costs will result in increased cargo flows and the demand for additional production factors, which will contribute positively to the GDP (CSIR, 2005). The overall effect will not be job losses, redundant capacity and less use of materials, but the higher productivity of the existing resources. As the globalisation of production and accompanying intensification of international competition has raised the price elasticity of the demand for most products traded in world markets, minor reductions in the landed costs of South African exports are likely to bring more substantial increases in demand. Thus the improvement in the cost-efficiency of South Africa's maritime supply chains will surely raise exports as well as the demand for transport within the country, both of which will add significantly to the GDP.

7.19.4 Extent of agreement with National Freight Logistics Strategy

Most of the deficiencies of South African maritime supply chains mentioned in this thesis are described more generally with application to the entire transport

system in the National Freight Logistics Strategy. In particular, emphasis is laid on “a failure to invest in infrastructure over the last (sic) twenty years” with the “added complication” of “a failure to provide appropriate inter-modal facilities that would facilitate seamless movement of cargo across modes at the port land interfaces” (National Department of Transport, 2005:1). The restructuring motivated for the maritime supply chains accords in all respects with recommendations in that document and generally provides more detailed reasoning and proposals to improve existing maritime supply chains. The ownership and operation of bulk supply chains by public-private partnerships and of container supply chains by liner shipping companies are not considered in the Strategy, but the “concession of certain terminals in SAPO” to private undertakings, the separation of ownership of the rail infrastructure from the operation of trains with access granted to private train operators and the promotion of railways as the mode of transport economically preferable to road haulage between the ports and Gauteng are advocated. The Strategy also supports the “fostering of private sector-led investment, capacity development and operational efficiency” (National Department of Transport, 2005:1) and maintains that the improvement of the poor performing national transport network “can only be achieved by an integrated system-level approach” (National Department of Transport, 2005:ii). It also concedes that “Introducing competition into the operations on infrastructure will allow more efficient operations to gradually overcome the general high level of inefficiency in the freight systems”, which clearly applies to the operations by Transnet.

The Strategy considers that “a major component of implementation is the development of integrated planning and the creation of a freight transport master plan that integrates the planning of the Government into all spheres: public agencies and the private sector, from both infrastructure and operations perspective”. However, it is doubtful whether the structural improvement needed to ensure the international competitiveness of South Africa’s maritime supply chains can await such planning, especially in view of the many planning and policy studies that have previously been undertaken without implementation²⁶⁾, several of which are quoted in the Strategy document. According to the International Advisory Council of the President of South

Africa, South Africa can readily reach an economic growth rate of 6% per annum, but the planning must cease and the implementation begin²⁷⁾. The proposals in this thesis are capable of implementation without further public planning as they depend largely on decision-making by the Government and Transnet and the role and function of the private sector through public-private partnerships. What is needed are in-principle decisions to involve the private sector in structuring far more efficient maritime supply chains. Tables 7.1 and 7.2 show the potential involvement of the private sector in such chains.

7.20 Conclusion

In this chapter, the emergence of chain leaders and the structural integration of South Africa's major maritime supply chains have been motivated with reference to the contents of all the previous chapters. Account has been taken of the policy of the Government towards the restructuring of state assets and attention has been focused on the aspects of conflict between that policy and world "best practice" in maritime supply chain development. Proposals have been made for the resolution of the conflict through public-private partnerships and tables illustrating the extent to which integration can be achieved are shown. The benefits of the proposed supply chain restructuring have been explained.

The identification of the difficulties that need to be overcome in order to achieve the integration required to ensure that South African supply chains develop in accordance with international trends in best practice confirm the main hypotheses of this thesis.

Endnotes:

1. For example, opportunity costs are determined by the border prices of imported alternatives – prices that fluctuate when currencies float according to the purchasing power parity reflected in exchange rates.

2. For example, cargo in containers stacked at terminals is often included in inventories if the time involved is a regular feature of the supply chain throughput and thus has value by saving storage space; or the period needed for fruit-ripening may include standing time if such time is unavoidable in the planned performance of the supply chain.
3. Because the opportunity costs of in-house shipping would be equivalent to charter rates in the tramp market.
4. For example, in Brazil, Argentina and Australia (Minerals Council of Australia, 2005).
5. Although provision is made for the nationalisation of industries in the Reconstruction and Development Programme (Reconstruction and Development White Paper, 1994).
6. With the use of superlinks, three TEUs can be carried per vehicle.
7. For example, Patrick Stevedores in Australia has formed an alliance with a national rail operator to provide rail services between Adelaide and Melbourne and has purchased a coastal shipping operation, while Toll Holdings, a trucking company, has purchased the Port of Geelong in order to provide end-to-end domestic services (Everett, 2001).
8. Transnet plans to expand the existing container terminal, widen the entrance to the port and deepen the channels (Richardson, 2004).
9. According to Baird (2001) increased efficiency in privatised British ports is attributable to reductions in personnel.
10. This is not an uncommon problem in ports where berths are reserved for exclusive use – the effect is often to promote monopolisation. It also occurs in the airline industry with the allocation of landing slots at airports and railways with open access regimes in which slots in train schedules are allocated to private operators.
11. These efforts include the proposed introduction of a tonnage tax, revision of the conditions for ship registration, changes to the Admiralty Jurisdiction Act and the training of seafarers.
12. For example, the Port Waratah Coal Services (PWCS) in the Port of Newcastle, Australia (Minerals Council of Australia, 2005).
13. After the currently planned expansion of the terminal is complete, the interest of the shareholders will be as follows: BHP, Billiton 33,1%, Anglo American 24,3%, Xstrata 20.9%, Total SA 5,7%, Sasol 5% and black-owned coal producers, Eyesizwe Coal and Kangra Coal Mines, the remainder (Bailey, 2005).
14. As estimated by the author from port data – the market shares of the liner companies are confidential.
15. An additional container terminal could be built in the Port of Durban in an area presently reserved for the South African Navy (Merit, 2001).
16. Personal knowledge of the author in the course of her employment.
17. “Erwin said the door also remained open for joint ventures between Transnet and private enterprise along the lines of existing J/Vs and added an assurance of an efficient railway between the port of Ngqura and Gauteng to ensure the new port would be competitive” (Hutson, 2005d:1).

18. It is presumed that the NPA will not impose penalties for the diversion of containers from Durban to Ngqura for which provision is made.
19. This topic has been extensively explored in Merit (Pty) Ltd, Coega Project (Port of Ngqura, South Africa) Independent Traffic Analysis, May 2003, 83p (Unpublished), but the results are too voluminous and complicated to summarise in this thesis.
20. Because of the rivalry between liner operators.
21. The prospect exists of constructing a container terminal at Salisbury Island in the harbour at Durban, on a base vacated by the SA Navy.
22. The charges for the use of port infrastructure (port and cargo dues) are arbitrarily determined at present and far exceed the opportunity costs of that use.
23. This came out when the concessioning of the container terminal in the Port of Ngqura was discussed between P&O Nedlloyd and Spoornet (New, n.d).
24. Generalised costs include freight, time costs and other costs depending upon the attributes of the service quality.
25. That the routes operated by Maersk between South Africa and Europe must be relinquished in view of the market control that Maersk as owner of both Safmarine and P&O Nedlloyd would otherwise exercise.
26. White Paper on National Transport Policy, White Paper on National Commercial Ports Policy, Moving South Africa: The Action Agenda, The Case for Measurement and Revitalisation of Basic Logistics Infrastructure in our Dual Economy (CSIR-document).
27. Meeting of the International Advisory Council, 22-23 October 2005, Pilansberg, as quoted by Visser (2205:s14).

CHAPTER EIGHT

CONCLUSIONS AND RECOMMENDATIONS

8.1 Conclusions

In Chapter One, the background to the importance of maritime supply chains is explained and the need to ensure that the chains serving South Africa are structured to ensure their competitiveness in world markets is emphasised. It is pointed out that in keeping with world trends integration of the links under single management is required in order to structure chains as entities and so achieve comparative cost advantages in the international competition between maritime supply chains. The contention is made in the form of a hypothesis that the role of Transnet as the provider of the port and rail links in South Africa's major maritime supply chains, in accordance with the policy of the Government, is not conducive to the structural integration of those chains. It is also contended that leadership in such development should originate in the private sector and that if public-private partnerships need to be established, those partnerships should raise the value-adding propensity of the chains as entities, rather than to serve the interests of autonomous link providers. The specific objectives and hypothesis of the study set out in section 1.5 are repeated hereunder and the extent to which they have been reached and established is explained in the following brief overview of each chapter. The objectives of the study are:

- i. To review the definitions and descriptions of 'supply chains' and 'supply chain management' in academic and business literature and to formulate the descriptions which best apply to the maritime supply chains serving South Africa.
- ii. To identify and analyse major South African maritime supply chains and their links and to determine through inquiry, surveys, comparisons with maritime supply chains serving other countries and research of literature,

strengths and weaknesses in their structures and management organisation.

- iii. To assess whether ownership and operation of the ports and railways in South Africa by Transnet Ltd is an advantage or disadvantage in the development of efficient maritime supply chains.
- iv. To reach conclusions on whether there are impediments to the development of efficient maritime supply chains for the seamless throughput of cargo necessary to maintain South Africa's competitiveness in world trade.
- v. To establish the hypotheses:
 - a. That the structural integration of the links in South Africa's major maritime supply chains is required in order to raise their efficiency and thus their competitiveness in global trade,
 - b. that such integration requires the value-adding propensity of the chains as entities to be raised by eliminating the individual profit-orientation of the links,
 - c. that the leadership of the private sector in the integration of the maritime supply chains is essential in accordance with world best practice,
 - d. that mining investors should lead the development of integrated supply chains for the export of large quantities of minerals and ores and that liner shipping companies should lead the integration of container supply chains,
 - e. that the development of the maritime supply chains serving South Africa in order to raise their efficiency through structural integration is presently being constrained by the role of Transnet and its performance,
 - f. that the role of Transnet in the public-private partnerships intended to finance new rail and port infrastructure will need to be adapted to the requirements of world best practice in maritime supply chain structuring.

The evolution of the concepts of a supply chain, supply chain management and integrated supply chain are dealt with in Chapter Two, by referring comprehensively to academic literature. Based on the examination of that

literature, an intermodal supply chain is defined as a system of transportation for the movement of freight between its origin and destination using two or more modes. When one of those modes is ocean transportation, the supply chain is regarded as a maritime supply chain for the purpose of this study. The review of the literature and the derivation of that concept complies with objective (i) of the study. The concept of a maritime supply chain is then taken further in the chapter by describing the links in typical maritime supply chains structured for the movement of cargo in bulk and in containers, as well as their elements and functions. That information provides the bases for the examination of actual South African maritime supply chains in Chapter Four and the conclusions in Chapter Seven on the structuring needed to achieve optimal efficiency.

As the Government is a major stakeholder in South African maritime supply chains through its ownership of Transnet, the history of Transnet and the background to the problems it is currently experiencing in the supply of rail transport and the handling of containers in ports are briefly described in the initial part of Chapter Three. Public statements by senior officials of Transnet acknowledging the problems and their origin are quoted and the plans for their solutions are outlined. Transnet's responsibility for the operation of the ports with reference to the National Ports Authority Act, 2005 (Act 12 of 2005) is then explained and attention is drawn to its financial dependence on the revenue of the ports. The perspective on the current role and financial predicament of Transnet leads to the subsequent part of Chapter Three in which the policy of the Government towards the future role of Transnet, as a state-owned transport enterprise, is examined. Reliance is placed on the policy statement of the Minister of Public Enterprises to Parliament in which the sale or privatisation of the core assets of Transnet is rejected, but the prospect of public-private partnerships in order to obtain private capital for development is raised. A key feature of the declared policy is that Transnet is required to fulfill the pivotal role in such development and by implication, in the function of the rail and port links in maritime supply chains. That requirement conflicts with the contention made in Chapter One that in accordance with world best practice, the efficiency of South Africa's maritime supply chains

should be raised through the integration of their links to function as entities under the leadership of private investors. The contents of the first three sections of Chapter Three contribute to meeting objectives (ii), (iii) and (iv) of the thesis by describing the fundamental weakness in South Africa's major maritime supply chains and the impediment to their efficient development attributable to the role of Transnet, in accordance with policy declarations on behalf of the Government.

Chapter Three concludes with an explanation of the Maritime Transport and Services Industry BEE Charter negotiated and accepted by the industry at the insistence of Government. In accordance with the policy of the Government, public-private partnerships entered into by Transnet as a state-owned enterprise must involve black economic empowerment. Although that requirement might facilitate the formation of partnerships involving maritime supply chain integration, the Government's rejection of privatisation involving the sale of the assets of rail and port links and the extent of the stakeholding of foreign liner shipping companies in South Africa's maritime supply chains, renders it unlikely that the black ownership target in the Maritime Transport and Services Industry BEE Charter could be attained. That is set at 25.1% by 2009. Furthermore, without the transfer of the ownership of their links in order to achieve full structured integration, the overall costs of the maritime supply chains will remain subject to rent-seeking by Transnet as the owner of the fixed assets of those links, which does not enable the efficiency of the chains to be optimised. This section of Chapter Three contributes further to the explanation of potential weaknesses in the structures of South Africa's maritime supply chains and impediments to their efficient development and complies with objectives (ii) and (iv).

The major maritime supply chains presently serving South Africa are described in detail in Chapter Four, in accordance with the generic descriptions in Chapter Two. In the descriptions of the chains of processes for the export of iron ore and coal, attention is drawn to the large investment in infrastructure and the physical interdependence of the infrastructure of the links and equipment. The technical features of those supply chains clearly

show that the mining, transport and loading of the products into the holds of the ships constitute processes that should compete as entities with similar processes elsewhere in the world market for commodities. If the links in the chains are separately owned and operated, co-ordination of investment in capacity and operational co-ordination at the interfaces in the chains are obviously at risk. That is a major reason for the current lack of capacity of the rail links in the chains for bulk exports and the operational problems experienced, and constitutes one motive for the complete integration of the links in the chains, in accordance with hypotheses (v)(a) and (b).

Chapter Four also contains an examination of the components of the container supply chains serving South Africa, from which it is evident that most of the containers are moved in the course of distribution generally rather than in integrated just-in-time supply chains (the concept of which is described in an overseas example in Chapter Five). Attention is focused on the function of the container terminals at the ports and the fact that the terminal in the Port of Durban handles the largest volume of container traffic of the three port terminals and is nationally the chosen port of entry and exit by container operators and their customers. The chronic congestion experienced at the terminal is also mentioned as well as the repeated urging by liner companies and others over many years that the private sector take over its operation. The problems and prospects for concessioning the operation of the terminal to a private undertaking dealt with in that chapter serve as the background to the conclusions concerning dedicated terminals reached in Chapter Seven. In Chapter Four, two maritime supply chains for the import of motor vehicle components on a just-in-time basis are also examined in order to draw attention to the allowances that currently need to be made for rail delays and that raise inventory costs. The chapter concludes with a description of the fruit supply chains that involve both the chartering of ships for palletised cargo by exporters and the rival use of containers for export by line shipping. In both circumstances, reliance is placed on road hauliers to move the cargo to the ports and the entire process of moving the fruit from growers to the overseas markets are integrated under the control of the exporters/marketeers. The fresh fruit supply chains are efficient because otherwise they would not exist.

Their significance for the purpose of the thesis is that they highlight the indispensability of supply chain integration if success in the market is to be achieved. Chapter Four meets the requirements of objectives (ii) and (iv) and shows that with the exception of the fruit chains, South Africa's maritime supply chains are not structured as integrated chains under single management striving to achieve the fundamental purpose of the chain.

Chapter Five begins with an examination of the trends in the privatisation of port facilities in ports throughout the world and the railway systems in five countries. Several maritime supply chains overseas are specifically described, as examples of what is achievable, given the deregulation of transport markets and the willingness of governments to dispose of their interest in state-owned enterprises or at least to allow leadership by private enterprises in developing maritime supply chains through state concessions or the sale of state assets, or in partnership with state undertakings. The main European example is the ERS, corporatised in collaboration with the Netherlands Government for the scheduled distribution of containers by rail and road feeder services throughout Europe. A feature of the ERS is its ownership by a single liner company (formerly two companies, now merged), which enables the provision of just-in-time services to and from the doors of the users of the services. The banana supply chain between Central America and Europe, as one of the oldest examples of a huge supply chain network of links under single management is also described. That chain has served as the role model for South Africa's successful maritime supply chains for the export of fresh fruit and, in fact, the managements are linked. The success of the chains overseas are undoubtedly attributable to their integration. The final overseas example in Chapter Five is the Pilbara iron ore supply chain system in Australia, which is the largest in the world, exporting several times the volume of iron ore exported by South Africa. Its phenomenal success is attributed to the fact that the entire operation from mine to ship is integrated under single ownership. As the organisation of the Pilbara iron ore supply chain is regarded as an example of world best practice in the bulk export industry, it is adopted as a benchmark for the improvement of South Africa's bulk supply chains. Chapter Five meets objective (ii) through the examination of the attempts to restructure

railways and ports in other countries in order to raise their efficiency and the examination of selected foreign maritime supply chains that have been structured through integration under single management and in some instances also ownership. By explaining the efficiency that those features of their structures have brought about, Chapter Five also furnishes conclusions that contribute towards the establishment of the hypotheses set in objectives (v)(a) - (d).

In the first part of Chapter Six, the maritime conventions and industry practices that are enforced by most countries with national registers, including South Africa, and which raise the costs of owning and operating compliant ships, are described and discussed. Control over the marine links in maritime supply chains for the export of commodities is then considered. With some exceptions, including the fruit chains, South African supply chains of bulk exports terminate with the loading of cargo on board ships chartered by foreign importers. The exporters have thus no control over the full landed cost of the cargo and, as explained, there is little prospect for change unless a national fleet under the South African flag is established through private investment, or foreign owners are attracted to the South African flag. Neither of these eventualities is likely notwithstanding efforts to promote domestic shipownership through changes in the tax and ship registration legislation and the training of seafarers for employment on the ships, but even if those efforts succeed, competition in the commodity markets will render it difficult for South African exporters to favour South African shipowners if their rates cannot match those in the charter market. As that market is served predominately by ships achieving competitive advantages under flags of convenience, ships under the South African national flag might not be able to compete. The best prospect for control over the marine link in the supply chain for South African bulk exports occurs when the entire chain to the loading of the ship is under the control of a single undertaking, which would then benefit from ship chartering through better control over the coordination of the landside and marine links and by being able to negotiate c.i.f. prices. That supports hypothesis (v)(d) that mining investors should best lead the integration of bulk export supply chains.

Liner shipping is also considered in Chapter Six and attention is drawn to the trends in the industry that have resulted in the concentration of the world supply under the control of a few shipping alliances and companies. South Africa is entirely dependent on the foreign liner companies for the imports and exports of manufactured goods as well as many raw materials in containers. Scale economies are an inherent feature of the cost structure of liner shipping and the operators have to ensure their profitability by exploiting any monopoly in the market, but more usually by raising the volume of cargo carried. As most of the income from container supply chains is generated onshore, liner operators also seek to raise their turnover by integrating landside links in order to control the entire door-to-door supply chain. Such control also ensures that cargo is sourced directly at its origin and not through third parties and explains the integration into liner operations of many of the lesser elements in container supply chains, described generically in Chapter Two. That background to liner operations provides some of the motivation for the argument in Chapter Seven, that the leadership of liner companies should be accepted in the development of more efficient container supply chains to serve South Africa. It also serves in the motivation in Chapter Seven for the integration of dedicated container terminals in the supply chains operated by liner companies. The conclusion derived from the discussion in Chapter Six on liner shipping and the motivation in section 7.11 is that the leadership of container supply chain integration should be provided by liner shipping companies, which confirms the hypotheses in (v)(c) and (d).

The application of the ISPS Code is also dealt with in some detail in Chapter Six, as the security of containers and ports has become essential because of the threats to civilian populations that can be implemented through interference with shipping by terrorist organisations. As security is likely to feature increasingly in the structure of container supply chains in the future and the interfaces between the links are the most vulnerable to terrorist intervention, integration of the links under single control becomes a safety measure as well. Such control, as motivated in Chapter Seven, is best exercised by liner companies and for that reason the imposition of the ISPS-code advances the cause of integrated container supply chains under the

leadership of liner shipping companies. That is the conclusion reached in the discussion on the ISPS-code in Chapters Six and Seven which contributes to the argument in confirmation of the hypotheses in (v)(c) and (d).

Aspects discussed in the first six chapters, but requiring further analysis in order to establish the hypotheses in Chapter One, are pursued in Chapter Seven. As it is not sufficient to establish merely the case for maritime supply chain integration, but it is necessary to explain how that could be achieved in practice, practical ways of restructuring the main chains described in Chapter Four through public-private partnerships are also examined. It is recognised, however, that the policy of the Government might not enable Transnet to participate in the particular public-private partnerships proposed because of the lesser role that it would then fulfill, under leadership of the private sector. Such recognition accords with the establishment of the hypothesis in (v)(e).

Throughout the thesis, it is emphasised that optimising supply chain efficiency requires the chain to function as an entity to serve only the purpose for which it is structured. That requires the financial and operational integration of the links as well as investment in the capacities of those links to be matched to the throughput of the chain. While the integration of links with decreasing marginal costs enables their economies of scale to be coordinated in order to optimise the overall lowering of the unit costs of the chain, the benefits from integrating links with costs that vary proportionally to throughput derive mainly from unified control of the modal interfaces, as explained in section 7.10. Among other advantages of such control is the avoidance of the potential disruption to cargo flows through differences by link managements in the application of the ISPS-Code, as explained in section 6.2. Those arguments support hypotheses v(a) – (c).

The integration of links in maritime supply chains exploited by third party service providers presupposes chain leadership, which is motivated in section 7.12. As the risk of the investment in the links of chains for the export of large quantities of minerals or ores depends upon insight of the world demand for those products, development of the chains must necessarily stem from the

investment in the mining ventures. That presupposes the integration of the links in the chains under the leadership of the mining investors, which is a feature of the world's most successful iron ore supply chain in Australia. The conclusion is accordingly drawn that the major South African supply chains for the export of mined products should be integrated with the mining ventures in keeping with world best practice, which accords with hypothesis (v)(d) and supports hypothesis (v)(e).

As supply chains moving containers convey goods for a multitude of owners, leadership of the development of those chains in order to raise their efficiency, in contrast to the leadership of bulk supply chains, must necessarily come from a third party providing services that enable the transaction between the sellers and buyers to be physically completed. That is also explained in section 7.12. The dominant provider of services is invariably the liner company as the marine link fulfils the pivotal role in maritime supply chains. Any of the other service providers, as described in Chapters Two and Four, would need to invest in shipping and thus become liner operators in order to acquire leadership of the chain. The fact that the foremost aim of the liner companies when raising supply chain efficiency is to enhance their profits, does not alter the principle that they are the logical chain leaders, which confirms hypothesis (v)(d). Effective competition in the liner industry should ensure that the economic efficiency of the supply chains is reflected in the costs to the users.

As it would not be feasible for any of the three container terminals in South African ports, which are common user terminals, to be dedicated to private use in an integrated supply chain of a liner company without creating a monopoly and prejudicing other liner companies and the users of their services, a new dedicated terminal to compete with the common user terminals is needed. The terminal still to be provided in the Port of Ngqura at Coega could fulfill that purpose, provided the operation of private container trains to and from Gauteng are integrated into the chain as discussed in section 7.14. That would necessitate improvements to the rail infrastructure. The conclusion is accordingly drawn that the efficiency of South African container supply chains could be raised through the integration of the links of a chain to include a

dedicated port terminal at Coega with private rail services to Gauteng, under the control of a liner shipping company, which confirms hypothesis (v)(d).

The proposed vertical integration of a dedicated container terminal in the Port of Ngqura and the operation of trains between Coega and Gauteng accords with trends overseas. As concluded in section 5.3 based on Table 5.5, an important feature of the restructuring of railways in the countries included in the survey is the scope afforded owners of bulk cargo and liner companies to integrate rail services into the management or control of maritime supply chains. A container supply chain using rapid rail services to serve Gauteng through the Port of Ngqura would restore the rightful role of rail transport for a substantial volume of South Africa's container traffic and achieve transport cost savings as indicated in Figure 2.5, as well as the benefits described in section 7.19.3. Those conclusions support hypothesis (v)(a).

As shown in Tables 4.5 and 4.6, the average utilisation of the railways between Durban and Gauteng and Port Elizabeth (or Coega) and Gauteng is well below the capacity available. If the route between Coega and Gauteng is upgraded to enable rapid container services even more capacity will be created. The infrastructure will be adequate to accommodate the required line occupancy, but additional locomotives and wagons will be needed with the build-up in traffic, as explained in section 7.16 concerning container supply chains. In view of the extensive use of road transport between Durban and Gauteng instead of rail services, use of a container terminal at Coega to serve Gauteng instead of the terminal at Durban will affect the transport of containers by road to and from the port rather than rail transport. That effect is likely to be experienced in a lack of growth of container traffic by road, which will result in the benefits discussed in section 7.19.3.

In section 7.16, attention is drawn to the competition that would be created by a container supply chain operated for the business of a liner shipping company. Provided that effective competition is ensured through the watchdog functions of the users of the services and statutory bodies, the efficiency of such an integrated chain would serve as a benchmark for container operations

because all the container ports compete to some extent for traffic to and from Gauteng. As container supply chains providing services from the origin of cargo to the destination compete against each other as entities, it is unlikely that the liner shipping company operating the integrated landside route between Coega and Gauteng would participate in the shipping conferences covering the traffic involved, which would add to the supply side competition to the benefit of the users of the services. The operation of a dedicated container supply chain between Coega and Gauteng by a liner shipping company is also likely to induce other liner companies handling sufficient volumes of traffic to contract their own dedicated supply chains when possible. Another consequence is that SAPO and Spoornet will lose their monopolies of the common user container terminals and rail facilities (for those that require rail service) and be under constant pressure to maintain efficient performances in order not to lose customers to the dedicated supply chain.

The scope for achieving integrated supply chains in South Africa as explained in section 3.3 is presently limited by the role of Transnet, as a state enterprise. In terms of the policy of the Government, Transnet will retain ownership of the railways and ports as well as the pivotal role in their operation and in terms of the National Freight Logistics Strategy, dealt with in section 3.5 and 7.19.4, efficiency in maritime supply chain construction will need to be tempered by welfare considerations. That rules out the prospect of the integration of the iron ore and coal supply chains with the mining ventures under the control of shareholders in the total export supply chain, as well as the integration of port terminals and rail operation in container supply chains controlled by liner companies. On the premise that world best practice requires such integration of the links in supply chains in order to achieve their efficient operation as entities, the prescribed role of Transnet constitutes an impediment to such integration and is thus not conducive to raising maritime supply chain efficiency. That confirms the hypothesis in (v)(e).

However, a *caveat* to this conclusion is that the policy of the Government does provide for public-private partnerships in order to attract private investment in public infrastructure. What that will entail in practice is still unclear, although

the prospect is of long-standing in declarations of intent by the Government and Transnet. If such partnerships will enable the establishment of undertakings including mining investors to develop own ore and coal chains as integrated supply chains, the impediment to the optimisation of their efficiency could be overcome. Similarly, if such partnerships could encompass a BOT agreement with a liner company for the construction of a port container terminal at Coega and the upgrading of the railway to Gauteng, an integrated container supply chain could be structured that would set the domestic benchmark for efficiency and through competition raise the quality of the services moving all containers through the ports to and from Gauteng. Without changes to the role prescribed for Transnet, it seems that those prospects could not be realised. The conclusion from this section of the thesis confirms hypothesis (v)(f).

In summary, the conclusions of the thesis achieve its objectives by showing:

- That in order to raise the efficiency of South Africa's maritime supply chains, integration of the links is necessary.
- That such integration requires the chains to add value to cargo as entities, which implies the elimination of profit-seeking by individual links.
- That private investors in mining should lead the structural development of maritime supply chains for the export of ores and minerals and that liner shipping should lead the structural integration of container supply chains.
- That the present role of Transnet does not permit the structural development of maritime supply chains under the leadership of the private sector and thus constrains the improvement of their efficiency in order to raise their international competitiveness.
- That scope exists for achieving the maritime supply chain development needed through public-private partnerships, provided the role of Transnet is changed to allow the private sector to lead the development.
- That these conclusions confirm the contentions of the thesis contained in Chapter One.

8.2 Recommendations

Several recommendations stem from the conclusions reached in this thesis. These concern the pursuit of studies: to identify the causes of costs and unproductive time that reduce the international competitiveness of South Africa's maritime supply chains; to estimate the extent, if any, to which their current efficiency should be foregone in the interests of equity; to determine the manner in which maritime supply chains should be structured through public-private partnerships in order to optimise their performance; to examine the merits of incorporating a dedicated container terminal in the Port of Ngqura in a major new supply chain to serve South Africa; and to estimate the effect on the GDP of the structuring of maritime supply chains in accordance with the proposals in this thesis. Outlines of the recommended research studies follow:

International competitiveness of South Africa's maritime supply chains

Empirical research is needed in order to analyse the costs added by each link in the supply chains for bulk exports that contribute to the f.o.b. prices of the products carried and which could be avoided through chain restructuring. The Coal line should be selected as the first example to be examined and comparisons should be drawn with the added costs (as percentages of the total unit costs of the chains) and link structures of competing supply chains in other countries. Similar research should be undertaken in order to identify the accumulation of unproductive time, and the causes, for the movement of cargo along container chains, and the results should also be compared with similar statistics for competing chains overseas. The purpose of the research should be to establish domestic benchmarks whereby improvements in performance can be monitored.

Extent to which equity should be taken into account

In view of the Government's concern about the "crowding-out" effect of private terminals (see [section 3.5](#)), particularly the Richards Bay Coal Terminal, in publicly-funded ports, it is recommended that a cost-benefit study be undertaken in order to compare the projected foreign earnings (or effect on the balance of payments) with the projected resource costs of operating the export coal supply chain (including the resources used for the function and upgrading of the public and private infrastructure) in order to estimate the net benefit derived by South Africa. Shadow pricing should be applied where market prices do not reflect opportunity costs and the projection should extend for at least ten years. The effects on income distribution of the operation and earnings of the supply chain should then be analysed in order to identify the beneficiaries¹⁾.

The cost-benefit study and the distribution analysis should be repeated on the assumption that the entire supply chain functions as a common-user facility, which will enable conclusions to be drawn on whether the efficiency of the existing supply chain would be compromised by a more equitable arrangement allowing common use. The cost-benefit study should be amplified still further in order to examine the improvement in efficiency and the consequences for income distribution if the links are structured to create a fully-integrated chain, owned and operated by a public-private partnership.

Attributes of a public-private partnership for maritime supply chains

The contents and conclusions of the thesis indicate clearly that the need exists for the attributes of public-private partnerships to be defined specifically to lead the restructuring of South Africa's maritime supply chains for the export of ores and minerals. Those attributes should enable the requirements for black economic empowerment to be met and for the efficiency needed to ensure that "whole" chains are internationally competitive to be achieved. It is recommended that a study be undertaken to determine specifically the

constitution, purpose and management of such partnerships and that comment be invited from organised business in order to ascertain whether the partnerships would attract private interest.

Container supply chain incorporating a terminal in the Port of Ngqura

In view of the absence so far of any clearly defined function for the Port of Ngqura in the logistics of South Africa's ports system²⁾ and the proposal by Transnet to equip it with a container terminal, it is recommended that further studies be undertaken to explore the prospect of incorporating the terminal in a dedicated container supply chain to serve Gauteng. The study should examine the competitive effect of such a supply chain on the other systems of container distribution and should build on the previous studies concerning that topic.

Effect on the GDP

The effect of the proposed structuring of South Africa's maritime supply chains on the GDP cannot readily be estimated because of the current lack of statistics on tonnages of exports and their value, costs of operating the links provided by Transnet (accounting as well as resource costs) and quantitative information on the delays to traffic caused by the lack of infrastructure capacity and avoidable disruption of cargo movement in recent years. Adequate information to derive an estimate is, however, obtainable through research, but that will take some time and require sufficient resources. It is accordingly recommended that a partial input-output analysis be undertaken through an adequately funded research project in order to project the contribution towards the growth in the GDP that could be achieved by improving the efficiency of South Africa's maritime supply chains in accordance with the proposals in this thesis.

Endnotes:

1. The feasibility and conceptual design of the cost-benefit study was derived in a discussion with Ms JP Naude, who is a practicing cost-benefit analyst with experience gained in many studies undertaken in South Africa and other countries (Hannelie Naude, Transport Economist, cc: hnaude@mweb.co.za).
2. As yet, the development committed to the Industrial Development Zone at Coega will not generate sufficient cargo to justify the provision of the Port of Ngqura, but the establishment of a container terminal to serve Gauteng would do so (Merit, 2002a).

