COMPETITION AND CONTESTABILITY IN TRANS-TASMAN LINER SHIPPING INDUSTRY

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of Applied Economics at Massey University

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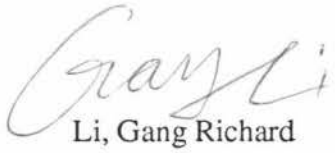
STATEMENT OF SOURCES

The work presented in this study is the original and independent work of the author, except where otherwise stated or acknowledged. No part of this work has been previously submitted to Massey University, or any other university, for the attainment of a formal qualification.



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I dedicate this thesis to my parents, who have encouraged and supported me to study overseas. They will continue to be a positive and strengthening influence in my life.

Finally, I would like to express all my proudness and happiness being with my dearest Ellen.

ABSTRACT

This study examines competition and contestability in trans-Tasman liner shipping industry for the period of waterfront deregulation. Contestability, often known as a benchmark in markets, is one of the most controversial issues of industrial organization theory. In this study, contestability in trans-Tasman liner shipping industry is analyzed, since this industry had been highly regulated and protected by trade union policy and practice until the recent waterfront reforms.

Using a normative analysis, the study finds that parts of the trans-Tasman liner trade exhibit characteristics of contestability, such as frequent entry/exit, an absence of sunk costs, and pricing behaviour. In contrast to the predictions of contestability theory, actual competition, rather than potential competition has been found to have a substantial effect on market performance. Hence, the study further employs a "Conjectural Variations" model to examine firms' strategic behaviours. The simulation results indicate that since post-deregulation, a period of intensive competition has occurred.

The study suggests that contestability theory may not be robust with small deviations from the assumptions. Instead, contestability theory supplements industrial organization theory with a new device specializing in performance implications of competition. In practice, the study concludes that deregulation has brought very substantial benefits to the shippers and to the national economy. As a result, a new wave of restructuring in the liner shipping industry and in the whole ports/shipping network is just beginning.

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LIST OF ABBREVIATIONS

AC	Average Cost
ANL	Australian National Line
ANZDL	Australia and New Zealand Direct Line
AVC	Average Variable Cost
BHP	Broken Hill Proprietary Transport
BTCE	Australian Bureau of Transport and Communications Economics
CER	Closer Economic Relations Trade Agreement
CIF	Costs, Insurance and Freight
DTC	Australian Department of Transport and Communications
FOB	Free On Board
GDP	Gross Domestic Product
LRAC	Long-Run Average Costs
LRMC	Long-Run Marginal Costs
MC	Marginal Cost
MOT	New Zealand Ministry of Transport
MUA	Australian Maritime Union
NVOCC	Non-Vessel Operating Common Carrier
PCM	Price-Cost Margin
P&O	Peninsular and Oriental Steam Navigation Company
P&ON	P&O Nedlloyd Container Line
SPS	South Pacific Shipping
SRAMC	Short-Run Average Marginal Costs
STARCH	Short-Run Average Total Costs
SARCO	Short-Run Average Variable Costs
TEL	Tasman Express Line
TEU	Twenty-foot Equivalent-container Unit
UDL	Union Direct Line

CHAPTER ONE

Introduction

> *A research agenda for the Transport industry must meet several criteria: 1) it must be relevant to the concerns of the industry participants; 2) the approach to creating knowledge must be systematic; 3) the research agenda should have a strategic focus; and 4) the research agenda must look ahead to deal with issues that will take the industry and New Zealand into the 21st century.*
> _ D. Mollenkopf, 1997, p. 13.

1.1 Trans-Tasman Liner Shipping Industry: A Brief Overview

The cheapening of ocean transport was the most significant factor in the development of international trade (*Containerisation International*, July 1995, p. 52). Since 1870 technical improvements in ocean transport have brought a world-wide trading network. The comparatively modern system of international exchange and specialization was made possible by the advent of the steamship with its ability to maintain regular schedules. Once the goods could rely on regular services to reach its markets, trade became less speculative and more a matter of supply and demand (Branch, 1975).

New Zealand, situated 1900 km from the nearest continent, Australia, is in a peripheral position with respect to world markets. Nevertheless, New Zealand is highly dependent on international trade for its livelihood. Merchandise exports in New Zealand represented 23.9 per cent of GDP in 1996, while imports represented 24.8 per cent of GDP in the same year (NZ Official Yearbook, 1997).

Australia is New Zealand's top trading partner, receiving 20.3 per cent ($NZ 4,207 million) of New Zealand's exports and supplying 23.2 per cent ($NZ 4,964 million) of New Zealand's imports in the June 1996 year. Meanwhile, New Zealand and Australia have enjoyed a closer relationship, namely the Closer Economic Relations Trade Agreement (CER), than any other pair of countries in the world. In 1996, exports from Australia to New Zealand (eastbound trade) comprised $NZ 4,964 million (54 per cent of

trans-Tasman trade) whilst exports from New Zealand to Australia (westbound trade) comprised $NZ 4,207 million (NZ Official Yearbook, 1997). Even though trans-Tasman trade is split relatively equally between Australia and New Zealand, it is more important to New Zealand than to Australia. Australia is the destination for one-fifth of New Zealand exports whilst the New Zealand market accounts for only 5 per cent of Australia's exports.

In 1996, about 85 per cent of the trans-Tasman trade by value and over 99 per cent by volume were carried by ship. In the case of imports, around 75 per cent by value were carried by sea and the volume was also over 99 per cent (NZ Official Yearbook, 1997, p. 512). Liner shipping is served by shipping lines maintaining regular services between specified ports according to schedules advertised well in advance. Trans-Tasman liner shipping accounts for over three quarters of trans-Tasman sea trade by value. In general, liner services carry containers and cars only. Specifically, the focus of this study will be the container shipping.[1]

Trans-Tasman liner shipping was firstly assessed as part of the 1992 full review of the Closer Economic Relations Trade Agreement (CER) undertaken by the governments of Australia and New Zealand.[2] The CER, signed in 1983 and reviewed in 1988 and 1992, is the most extensive bilateral trade agreement entered into by either country. It aims to rationalise and integrate the economies of Australia and New Zealand by removing barriers to trade in goods and services as well as harmonising business regulations. All goods traded trans-Tasman have been free of tariffs and quantitative restrictions since 1 July 1990. There has also been free trade in most service sectors since 1 January 1989 (NZ Official Yearbook, 1993).

As at January 1992, twelve vessels operated by a total of six shipping companies to carry cargoes between Australia and New Zealand. These services were provided by "dedicated operators" (those operating in the trans-Tasman trade only). Of these vessels, nine were manned by New Zealand crew and the remaining three by Australians. In the meantime,

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[1] Without exception, the liner shipping in this study means the container shipping only.

[2] The joint review of trans-Tasman shipping policy was instigated by the Prime Ministers of Australia and New Zealand in their Joint Statement of 2 July 1990 on Closer Economic Relations (NZ Official Yearbook, 1993). It was conducted jointly by the Australian Department of Transport and Communications (DTC) and the New Zealand Ministry of Transport (MOT).

foreign crewed vessels were excluded from the trans-Tasman trade by trade union policy and practice, in particular by the "Maritime Union Accord". As stated by the 1992 review, the anti-competitive structure of trans-Tasman liner shipping represented a constraint to the CER. In a policy sense it has been widely accepted that trans-Tasman liner shipping is a service to facilitate trade, rather than being an economic activity on its own right (DTC and MOT, 1992). Therefore, reforms have been conducted in the past few years on both sides of the Tasman sea.

The New Zealand *Shipping Gazette* (Holiday Issue, 1997) indicates that "the 'Maritime Union Accord' appears to be in its death throes, heralding greater competition and a major shakedown in trans-Tasman shipping" (p. 2). Currently, it is an open secret in the trans-Tasman shipping industry that foreign-flagged and crewed ships and 'cross-traders' (those operating trans-Tasman service on part of a larger international route) have been carrying trans-Tasman cargo, despite the existence of the "Maritime Union Accord". As a result, in 1997 thirty-seven crosstrading vessels announced to enter trans-Tasman liner shipping market whilst fourteen Australasian crewed vessels provided the dedicated services.

1.2 Objectives and Structure of the Research

Despite continuous scrutiny by public policy makers, there is relatively little economic research into this dramatically reformed industry. The purpose of this research is to fill this gap by undertaking an empirical study of trans-Tasman liner shipping and drawing tentative policy conclusion from it. The analysis in this study will test the hypothesis put forward by economists prior to the reform that productivity would improve with reforms and, in particular, cost factors will display the great improvement.

One hypothesis is that, under shipping regulation,[3] the "Maritime Union Accord" (the "Accord") encouraged and maintained a collusive cartel among shipping firms by limiting competition on routes, prohibiting entry of new ships, and fostering anticompetitive

[3] As stated by a senior official of the NZ Ministry of Transport in our interview, trans-Tasman shipping has never been legally regulated. Ther are no government laws or regulations that prevent the participation of foreign flag ships in the trans-Tasman trade. However, in practice foreign ships were excluded by the trans-Tasman "maritime union accord" (the Accord). Hence, the term of 'deregulation' employed in this study means 'breaking the Accord".

agreements and consolidations. An implicit corollary is that trans-Tasman shipping deregulation encouraged a competitive market by eliminating regulatory restrictions and collusive activities. In contrast, an alternative hypothesis is that deregulation replaced a public-utility-type regulatory structure and allowed the trans-Tasman liner shipping industry to become highly concentrated and operate as a monopoly.

1.3 Competition and Contestability: Concepts

Because of unsatisfactory data, it is not appropriate to use an econometric methodology. The approach which is taken here involves the use of a detailed case study. As an empirical research in "Industrial Organization" theory, it yields some interesting insights to recover the industry's basic conditions and behaviour. Further, this research is devoted to uncovering the different roles assigned to industrial policy, depending on whether the emphasis is placed on spontaneous adjustment to market forces or on strategic behaviours of firms.

To this end, the methodology used in this research will be based on the theory of contestable market developed by Baumol-Panzar-Willig (1982 and 1986a). A perfectly contestable market is defined as one where: 1) on the production side, entrant and incumbent must be symmetrically placed, being subject to the same regulations, having access to same technology, and being perceived to produce outputs of similar quality; 2) in the technology of production, sunk cost must be absent; and 3) the pricing practices of the market must be such as to prevent responsive pricing by incumbents (Dixit, 1982). When these conditions are satisfied, allocative efficiency, X-efficiency and zero profits will result (Baumol *et al.*, 1982).

In a perfectly contestable market, perfectly competitive performance is spontaneously achieved irrespective of the number of firms present and their scale of production or capital requirements (Baumol *et al.*, 1982). In essence, "the mechanism responsible for achieving this is an omnipresent threat of potential competition" (Spence, 1983, p. 983). In other words, the threat of 'hit-and-run' entry, not actual entry, is the linchpin of contestability theory (Schwartz, 1986).

Davies (1986) applies contestability theory to examine the Canadian shipping experience between 1971 and 1982, and concludes that the theory of contestability has found some supporting facts in the shipping industry. Furthermore, Bailey and Baumol (1984) argue that the concept of contestability could be an eminently relevant analytical tool for regulatory policy. In the same line, this study will look at the present degree of market contestability in the trans-Tasman liner shipping market, and attempt to explore the performance and future prospects of the industry.

Nevertheless, this market mechanism and the concept of contestability have been the target of considerable criticism, especially in terms of realism, robustness and generality (see for example, Brock, 1983; Shepherd, 1984 and 1988). With respect to market equilibria, Shepherd (1984) and Brock (1983) indicate that contestability theory does not employ traditional formulations because its equilibrium conditions are simply generated by perfectly contestable markets. In reality, however, markets are invariably less than perfectly contestable. In addition, Schwartz and Reynolds (1984) argue that contestability theory might only apply for some small neighborhood of costs above zero sunk costs. Beyond this, they expect monopoly prices to prevail. Strategic behaviour models also suggest that prices in concentrated markets may remain high, despite low sunk costs (Fudenberg and Tirole, 1984).

To counter this argument, Grossman (1986) points out that it is important to conduct an analysis on strategic behaviour which could lead to the outcomes predicted by contestability theory. In this respect, reaction functions, conjectural variations and the other concepts traditionally used to analyse oligopoly equilibrium are applicable. Accordingly, this study will further employ a traditional "Conjectural Variations" model to examine market conduct, thereby exploring the relationship between contestability concept and traditional oligopoly concepts.

1.4 Chapter Outlines

The structure of this research is as follows. Chapter Two provides an overview of the relevant literature on contestable market theory. It attempts to address the importance of contestability as a crucial factor which may impinge upon the concept of competition.

Chapter Three presents the descriptive analysis of trans-Tasman liner shipping industry. The focus of this chapter is to provide the trans-Tasman shipping in perspective by examining its history, and its characteristics and performances, in particular with regard to its "deregulation". Chapter Four applies a normative analysis to evaluate contestability in the trans-Tasman liner trade. Data and some of its implications are also discussed. To explore market conduct, Chapter Five employs a "Conjectural Variations" model to conduct an analysis of firms' strategic behaviours. A conclusion appears in Chapter Six. It summarizes the results, and discusses further area of research.

CHAPTER TWO

Theories and Empirical Analysis of Competition and Contestability: Literature Review

> *... [Contestable] markets, even if actually served by only one firm, exhibit many of the desirable properties of competitive markets in the sense that a weak version of Adam Smith's invisible hand holds sway.*
> _ E. E. Bailey and J. C. Panzar, 1981, p. 125.

2.1 Introduction

This chapter reviews theoretical and empirical literature that is most pertinent to the study of competition and contestability. It attempts to discuss the debate on competition and contestability within the context of analyzing a specific industry. The issue of competition and contestability has increasingly received attention from many economists who aim to conduct research in industrial organization in recent years (see for example, Jacquemin, 1987; Tirole, 1988; Scherer and Ross, 1990).

For a century the field of industrial organization has struggled to clarify the nature of effective competition. The modern study of competition and monopoly dates back to the work in the 1880s by John B. Clark, Henry C. Adams and Charles J. Bullock (Dixit, 1982, p. 12). Going beyond the extreme cases of perfect competition and monopoly, contemporary studies show that effective competition is actually much more complex, for instance, the introduction of monopolistic competition, oligopolistic interdependence, and Cournot-Nash equilibrium (see for example, Friedman, 1983; Tirole, 1988; Scherer and Ross, 1990). It is also important to note at this stage that research in industrial organisation is often highly abstract with a high level of technical sophistication, such as notions of game theory (see for example, Friedman, 1986; Tirole, 1988). Furthermore, dynamic approaches in industrial structure have come to replace static approaches.

In this chapter, the prime focus lies in the impact of effective competition on pricing and barriers to new competition. Contestability, which is an issue of the positive analysis and normative appraisal of imperfectly competitive firms and markets, has some important implications on pricing and barriers to new competition (Baumol *et al.*, 1982). However, a comprehensive review of the entire literature on general effectiveness of competition is so vast and diverse that it is beyond the scope of this chapter. An attempt to do so may also undermine the focus on contestability in this limited space.

This chapter is structured in such a way to review how, in the past, economists have tried to explain the concept of contestability, and to discuss why this attempt has been controversial. Section 2.2 presents theoretical explanation of contestability theory, with emphasis on analyzing the dynamics of entry. Section 2.3 discusses the competition and contestability relationship and highlights the flaws and inadequacies in the previous studies of contestability. Section 2.4 reviews the empirical studies on competition and contestability, in particular, "conjectural variations" studies. The last section presents a summary of the literature discussed in this chapter.

2.2 Contestability Theory

The development of industrial organization theory has essentially two strands. There are the contributions by Joe Bain and Edward Mason, namely the "Harvard Tradition School", and by George Stigler, namely the "Chicago Tradition School". In his classic work "Barriers to New Competition", Bain (1956) indicates that, under increasing returns to scale, only a limited number of firms are viable, and these firms make positive and supranormal profits without triggering entry. The reason is that, "if potential entrants know that a duopoly yields negative profits, the incumbent can quietly enjoy a monopoly profit without worrying about the threat of entry" (Tirole, 1988, p. 307). This conclusion was later challenged by the "Baumol Group" (1982 and 1986a), who argued that the limited number of firms in market does not mean there is no competition and that perfectly competitive performance can be spontaneously achieved by the threat of entry and potential competition. In his presidential address at the 94th Meeting of the American Economic Association in Washington in

December 1981, William J. Baumol outlined and discussed an extensive and ongoing research area called the theory of the contestable market. Contestability theory is "a set of ideas and analytical techniques whose object is the positive analysis and normative appraisal of modern, multi-product, imperfectly competitive firms and markets" (Baumol, 1982, p. 14).

2.2.1 Contestability Theory: A Theoretical Background

In the framework of partial equilibrium analysis, Baumol, Panzar, and Willig (hereafter, the Baumol Group) (1982) propose a market structure that describes the behaviour of incumbent firms constantly faced by threats of entry. The basic idea that the threat of entry may constrain pricing in concentrated industries dates back at least to Bain's work (1949). As Scherer *et al.* (1990) indicate, work by the Baumol Group has extended "the analysis of limit pricing by a dominant firm to the multi-product case" (p. 361).

The idea underlying limit-pricing is that a monopoly may be able to deter entry by conveying signals to the potential entrants that entry is not profitable (Bain, 1949). It follows that an established firm may set its prices below their short-run maximizing levels in order to deter entry. A weakness of this literature has been the failure to model both the established firm and the entrant as strategic agents (Milgrom *et al.*, 1982, p. 457).[4] For instance, if the entrant is rational with complete information, pre-entry prices will not influence its entry decision, so the established firm has no incentive to practise limit-pricing. Meanwhile, it is questionable whether established firms face only a dichotomous choice between deterring all fringe entry or raising prices to the short-run profit-maximizing level (Scherer *et al.*, 1990)

Gaskins (1971) introduces a fully dynamic model of dominant firm pricing that provides analytic justification for firm's strategic dichotomy. Gaskins (1971) argues that a dominant firm facing the prospect of entry or expansion by a competitive fringe will maximize its long-run profits "by balancing current profits against the impact of that entry and the resulting reduced market shares on future profits" (Scherer *et al.*, 1990, p. 362). The basic Gaskins model provides a rich set of predictions about how the pricing behaviour and profits of firms

[4] Milgrom and Roberts (1982) design a game of incomplete information to model this problem.

with monopoly power will vary both statically and dynamically with cost conditions, factors affecting the speed of entry, and market shares (see Scherer *et al.*, 1990).

On the other hand, with respect to uncertainty and lumpy entry, Kamien and Schwartz (1971) also develop a dominant firm entry deterrence model. In this framework, the post-entry price and the entrant's market share will determine the attractiveness of entry. In other words, "a firm contemplating entry on a large scale has reason to fear that its incremental output contribution will be absorbed by the market only if the price is reduced" (Kamien *et al.*, 1971, p. 451). Consequently, even though the entrant's costs may be as low as those of incumbents, and even though the pre-entry price exceeds the entrant's full expected unit cost, the price after entry may fall below that cost, and entry will prove to be unprofitable. Hence, if this is anticipated, entry will be deterred.

Contrary to this argument, the Baumol Group (1982) proposes an analytic structure in which it is appropriate to relate the large-scale entry to the pre-entry price. Suppose that the entrant is able to sell to customers before incumbents have an opportunity to change their price. Suppose, further, that at the price quoted, the entrant could earn enough revenue to cover all variable and fixed costs of production, including all sunk costs if any. Baumol *et al.* (1982) postulate incumbents being completely vulnerable to "hit-and-run" entry.

The Baumol Group (1982) focuses on the economies of multiproduct firms. Assume two properties of cost functions in the product-specific economies: 1) unit costs are reduced by producing more of a specific product; and 2) costs are reduced by producing two or more products jointly. Thus the ability to deter entry is also affected by economies of scope. To summarize this, Scherer *et al.* (1990) point out that:

> *The combination of these two properties determines in a complex way whether the cost function is* ***subadditive****, that is, whether a single firm can supply a bundle of outputs demanded by the market at lower total cost than some combination of two or more single-product and/or low-volume producers. If subadditivity holds, the dominant firm may (but in special cases cannot) devise a set of prices that is* ***sustainable****, permitting the*

> *incumbent at least to cover its costs while entrants can find no overlapping output bundle at which their costs are covered. Thus, a set of sustainable prices includes limit prices for each product. As in the single product case, sustainable prices yield supra-normal profits only when there are entry barriers* (Scherer *et al.*, 1990, p. 361; emphasis added).

Furthermore, Baumol *et al.* (1982) combine the two types of definitions of an entry barrier advocated by Stigler (1968) and by von Weizsacker (1980), and then develop a concept of barrier as an undefined object in terms of its undesirable consequences for social welfare. Stigler (1968) proposes that:

> *"... a barrier to entry may be defined as a cost of producing (at some or every rate of output) which must be borne by a firm which seeks to enter an industry but is not borne by firms already in the industry"* (Stigler, 1968, p. 67).

This definition is adopted by the Baumol Group, who explicitly identify a barrier with an "expenditure" (Baumol *et al.*, 1982, p. 282). In addition, Baumol *et al.* (1982) cite the approach of von Weizsacker (1980),

> *"... barriers to entry are a distortion of the competitive process. They inhibit the proper working of the principle of the 'invisible hand', and thus imply inefficiencies...Entry... is suboptimal because incumbent firms are protected from entry"* (von Weizsaecker, 1980, pp. 399, 400).

In the absence of barriers, markets in which entry is ultra-free are defined as *perfectly contestable* (Baumol *et al.*, 1982). Free entry and free exit mean that there is no sunk cost giving rise to a barrier in Stigler's (1968) sense of a cost borne by an entrant but not an incumbent. The aim of this hypothesis is "to create a symmetry among the firms" (Baumol *et al.*, 1982, p. 349).

In this framework, when potential entrants have access to the same technology as incumbents, when there are no sunk costs, and when a firm can enter and exit the market before incumbents can respond, the market is perfectly contestable. The only sustainable price available to incumbents under these conditions is one that just covers average cost (Baumol *et al.,* 1982). This result will hold regardless of the industry's structure. Moreover, the configuration of firms in a contestable market is determined endogenously (Morris *et al.,* 1986). Essentially in a perfectly contestable market, "economies of scale and scope may limit the number of firms operating to some small cost-minimizing group, but they will not allow incumbents to elevate prices above average cost" (Scherer *et al.,* 1990, p. 376).

Since then, there have been many papers published by authors offering theoretical extensions, empirical and interpretative applications (see for example, Schwartz and Reynolds, 1983; Schwartz, 1986; Davies, 1986a; Franck and Bunel, 1991; and Shmanske, 1996). Meanwhile, due to the some exaggerated claims for its generality and policy relevance, contestability theory has been in receipt of considerable criticism (see for example, Brock, 1983; Weitzman, 1983; Shepherd, 1984 and 1988). Consequently, while some of the components of the theory have been accepted by the profession virtually without reservation others are still the subject of continuing debate.

2.2.2 Principles of Contestability

Principal themes in the theory of contestability are discussed as follows: 1) the concept of contestability as a means of assessing the nature and the behavioural and structural consequences of market forces; and 2) market equilibrium in a perfectly contestable market.

Sunk Costs The main assumption underlying the contestable market structure is that entry does not require any sunk costs. The concept of sunk costs is distinctive from that of fixed costs. Fixed costs are sunk only in the short run. Instead, "sunk costs are those investment costs that produce a stream of benefits over a long horizon but can never be recouped" (Tirole, 1988, p.308). Baumol *et al.* (1982) point out that the presence of a high proportion of fixed costs in an industry's cost structure likewise does not necessarily imply the presence of significant sunk costs. It should also be noted that there is no necessary correlation between economies of scale and sunk costs.

The cost of exit is seen to be a key factor influencing the strength of new entry competition. Contestability theory shows that it is the significance of sunk costs in the requisite investment that determines the costs of exit. If the capital employed is reusable, saleable, rentable or mobile, sunk costs will be low and exit consequently relatively costless and easy. Hence, the risks of entry are seen directly to correlate with the significance of sunk costs. In other words, with the absence of sunk costs incumbent firms are subject to a "hit-and-run" entry.

Potential Entrants and Incumbents The potential entrants in a perfectly contestable market possess two properties. First, they can serve the same market demands and use the same productive techniques as those available to the incumbent firms; this ensures that the potential entrants are not subject to any cost disadvantages. Second, the potential entrants evaluate the profitability of entry at the incumbent firms' pre-entry prices. In a perfectly contestable market, potential competitors can enter and exit without capital loss during the time taken by incumbent firms to change prices and without having to wait until they generate a sufficient amount of revenue to recover the sunk costs of entry (Baumol *et al.*, 1982).

Hence, if incumbent firms do not have any cost advantage over potential entrants, a contestable market equilibrium will result in having an incumbent firm making only normal (zero) profit. In this market, the inefficiencies traditionally associated with high concentration will not arise. An oligopolistic or even a monopolistic industry can be perfectly contestable if it is characterized by complete freedom of entry and exit. The concept of a perfectly contestable market therefore is designed to provide "a benchmark that applies in markets for which the concept of perfect competition is not very useful" (Baumol, 1982, p. 3).

Feasible Configuration The configuration of an industry $(m, q_1, q_2, \ldots, q_m, p)$ is called feasible if: (1) the m firms in the industry produce output levels of $q_1, q_2, \ldots, q_m$ at a non-negative price p that equates market supply and demand, $\sum_{i=1}^{m} q_i = Q(p)$, and (2) each firm at least covers its production costs, $pq_i - C(q_i) \geq 0$, $i=1,\ldots,m$. In this sense, "the

industrial configuration will be a monopoly if $m=1$; competitive if m is sufficiently large; or oligopolistic for intermediate values of m" (Jacquemin, 1987, p. 25).

Sustainable Configuration A feasible industrial configuration with price p and firm outputs $q_1, q_2, \ldots, q_m$ is called sustainable if there is no possibility of profitable entry in the market, that is, for all $p_e \leq p$ or $q_e \leq Q(p_e)$, $p_e q_e \leq C(q_e)$. It means that, "under the assumption that the prices at which incumbent firms operate are not changed after entry, the entrant has no feasible plan of action that will guarantee positive profits" (Jacquemin, 1987, p. 27).

2.2.3 Equilibria in a Perfectly Contestable Market

In a perfectly contestable market, equilibrium can be reached only by a sustainable industrial configuration.[5] If the configuration were not sustainable, it would be always worthwhile for some firms to enter the market without costs and take out some profits. Given that equilibrium requires the absence of new entrants, an equilibrium configuration in a perfectly contestable market must not offer any opportunity and incitement to entry. Hence an equilibrium configuration must be sustainable.

Properties of a Perfectly Contestable Market

In a perfectly contestable market, equilibrium has some important properties: 1) in a sustainable configuration the market demands must equal the total outputs of all the firms; 2) at a sustainable price level each firm's revenues are no less than its costs; and 3) there must be no opportunities for profitable entry to potential entrants who regard the prices of the incumbents as fixed. Moreover, Baumol *et al.* (1982) point out that:

> *If certain conditions, such as production techniques and market demands, are satisfied, the Ramsey-optimal prices for the monopoly firm (that is, the prices which maximize consumer welfare, subject to the financial viability of the firm) are guaranteed to be sustainable and are therefore guaranteed to effect an equilibrium in a contestable market* (Baumol *et al.*, 1982, p. 6).

[5] A sustainable industrial configuration is of course feasible.

Sustainable Configuration in Single-Product Industries

To achieve sustainability, even a natural monopolist must operate efficiently and can only earn zero economic profit. A single-product case is discussed below. Following Baumol *et al.* (1982), there is a homogeneous good industry with n firms. All firms have the same technology, and produce output q at costs $C(q)$ with $C(0) = 0$. There are only two possible types of sustainable configuration in single-product industries. The first type, represented in Figure 2.1, involves a single firm which charges the lowest price that is consistent with non-negative profit.

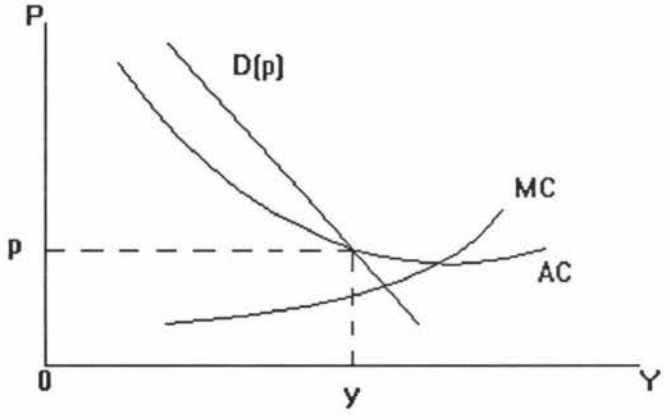

Figure 2.1 Sustainable Configuration in Single-Product Industries

As Figure 2.1 illustrates, the firm must be a natural monopoly when it produces the quantity y that is demanded at this price p. The feasible configuration, comprised of one firm producing and selling y at the price p, is sustainable. At a price equal to or less than p, sale of any quantity on or below the demand curve $D(p)$ yields revenue no greater than production costs $C(y)$. It follows that price does not exceed average cost (AC). Yet, this configuration is not a long-run competitive equilibrium. This is because $py_t - C(y_t) > 0$, for $y_t > y$ and, at y, p exceeds marginal cost (MC). As the only intersection of the demand and average cost curves occurs in the range of increasing returns to scale, "there is no possible long-run competitive equilibrium" (Baumol *et al.*, 1986b, p. 343). In this circumstance, the result maximises

welfare, subject to the constraint that all firms are viable financially without subsidies. And such a second-best maximum is referred to as a "Ramsey optimum" (Baumol *et al.*, 1982).[6]

The second type of sustainable configuration involves production, by two or more firms, of outputs at which both marginal cost and average cost are equal to price. In the long run, all active firms exhibit the behaviour that characterises perfectly competitive equilibrium. Hence, it follows that the result involves both first-best welfare optimality and financial viability. In this case, Ramsey optimality and the first-best coincide. This establishes the result that, in single-product industries, any sustainable configuration is Ramsey optimal (Baumol *et al.*, 1982).

To assess contestability theory, Jacquemin (1987) argues that the notion of a perfectly contestable equilibrium is a generalization of the perfectly competitive equilibrium. A long-run competitive equilibrium is certainly a sustainable industrial configuration, and a perfectly contestable market. Further, a perfectly contestable equilibrium does not require a large number of firms in the market. It includes the case in which technology has important returns to scale. In addition, Spence (1983) points out that contestability theory's use is mainly in the analysis of multiproduct costs and efficient industry structures, thereby providing a welfare standard. To summarize, Spence (1983) argues that:

> *"... the [contestability] theory is an attempt to provide a substitute for the theory of perfect competition, one that is applicable in a world characterized by scale economies or by the multi-product analogues. Perfect competition theory serves two functions in economics. It is sometimes a reasonable approximation to reality in the descriptive sense, and perhaps*

---

[6] Spence (1983) discusses three different forms of a Ramsey optimum regarding the theory of contestable market. In essence, a viable industry Ramsey optimum is the solution to the problem:

$$\max \quad W(p) + \Sigma (py^i - c(y^i))$$
$$\text{subject to} \quad Q(p) = \Sigma y^i \text{ and } \Sigma py^i - c(y^i) \geq 0$$

where W(p) is the multiproduct surplus (Spence, 1983, p. 988). Under Ramsey pricing, each price contains a mark-up above the long-run marginal cost of the product or service to cover a portion of the unattributable costs (Baumol *et al.*, 1986a, p. 505). The unattributable costs are allocated among buyers in inverse relation to their demand elasticity. Thus, in a highly elastic market, the mark-up would be smaller than in a less elastic market. In this sense, Ramsey pricing is a method of differential pricing, that is, pricing in accordance with demand (Baumol *et al.*, 1986a, p. 505).

> *more importantly it is a welfare standard. In the absence of externalities, perfectly competitive equilibria are Pareto optimal ... The contestable market theory then provides a more robust welfare standard*" (Spence, 1983, p. 982).

In short, contestability theory maintains that the threat of new entry will be sufficient to discipline incumbent firms. It shifts attention away "from structural measures of market power (such as concentration ratios) and from the nature of oligopoly interactions towards variables that affect the ease of entry and exit" (Schwartz, 1986, p. 37).

2.3 Competition and Contestability

In general, contestability theory introduces an extreme, benchmark case of the perfectly contestable market. In this framework, threat of entry ensures satisfactory performance regardless of the sizes of incumbents and regardless of any oligopolistic interactions among them. At first glance, this approach, by endogenously leading to social optimum, offers a solution to the many problems of inefficient market structure. And more important, contestability theory provides an insight to uncover firms' conduct "by modelling production costs in a dynamic framework and by analyzing the dynamics of entry" (Roller, 1987, p. 5).

Nevertheless, the concept of contestability and its implications for market equilibria, have been the target of considerable criticism, particularly in terms of realism, robustness and generality. With respect to market equilibria, contestability theory does not employ traditional formulations because its equilibrium conditions are simply generated by perfectly contestable markets. In the reality, markets are invariably less than perfectly contestable. Hence, critics say, contestability theory is just a special case, not a generalization of perfect competition as claimed by the Baumol Group (Shepherd, 1984).

It is also important to note that contestability theory has limited applicability as descriptive theory; instead, it mainly establishes normative theory that is much wider in scope than perfect competition (Spence, 1983). The usefulness of normative theory is largely determined

by two factors. First, the benchmark itself must be well established, reasonably attainable, and can lead to socially desirable outcomes. Second, it is imperative to show that "the benchmark is well approximated and approached by a market close to the hypothetical limiting case and that its policy suggestions hold in markets away from the ideal" (Roller, 1987, p. 2). Therefore, it is necessary to review theoretical extensions to contestability theory, and more important, to review the discussions about its robustness.

2.3.1 Relationship between Competition and Contestability

Contestability theory is a static (partial) equilibrium theory of industry structure, conduct and performance. Instead, Tirole (1988) designs a two-stage game which yields the contestable outcome. Suppose that firms first choose prices simultaneously and then choose outputs. Firms choose prices before quantities. Suppose further that all potential firms choose the same price p. If one of them chooses output y and the others produce nothing (stay out), there is a sustainable equilibrium. In this respect, all firms make zero profit. If a firm were to undercut price p to enter this market, it could not earn positive profits. Hence, the theory of perfectly contestable markets can be seen as "a generalization of Bertrand competition to markets with increasing returns to scale" (Tirole, 1988, p. 310).

Grossman (1986) further argues that it is important to analyse the kinds of strategic behaviour that led to the outcomes predicted by contestability theory. To achieve this end, a simple partial equilibrium model with a single commodity is employed to examine the relationship between Bertrand equilibrium and sustainability. This model is outlined in Figure 2.2. As Figure 2.2 shows, aggregate demand D is chosen so that it cuts the minimum point of a single firm's average cost curve. The Bertrand equilibrium in this special case occurs when a single firm produces at the competitive price P. On one hand, lower prices will yield only losses for firms. On the other hand, higher prices will abstract entrants to undercut the incumbent firm's price, thereby capturing all the demand with a profit. In this framework, the perfectly competitive price and output constitute a sustainable configuration. Hence, the Bertrand equilibrium is sustainable.

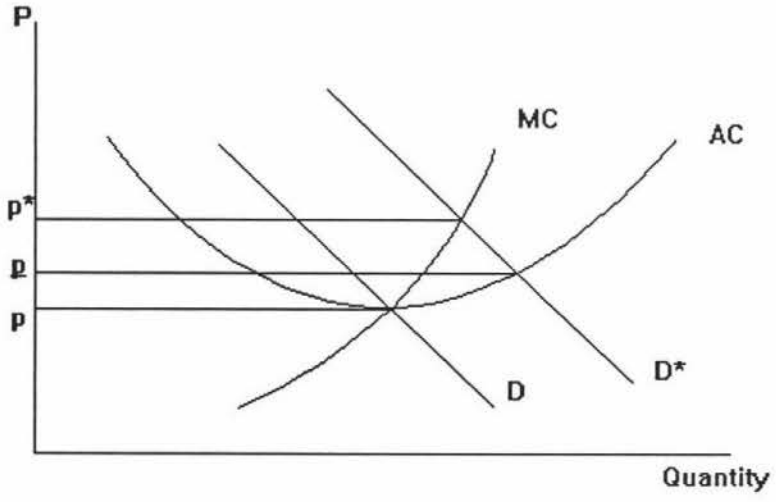

Figure 2.2 Relationship between Bertrand Equilibrium and Sustainability

However, there might not be any sustainable equilibrium either. Suppose that a demand curve D^* moves slightly to the right of D, that is, D^* no longer cutting the average cost curve at the minimum point. Then Bertrand equilibrium could not exist. It implies that profits could be made selling to residual demanders, when a single firm charges p and supplies at the minimum point of the average cost curve (AC). Hence, "the competitive price is not even feasible, since demand exceeds supply for all levels of output that does not make losses" (Grossman, 1986, p. 368). In this circumstance, no sustainable configuration exists.

In addition, Grossman (1986) suggests that it might be possible to use strategic considerations to construct equilibria even when sustainable configuration does not exist. Specially, "firms' strategies might consist of supply functions rather than simple price-quantity strategies" (Grossman, 1986, p. 369). A supply function implies a commitment to match price cuts by new entrants. It follows that incumbent firms are willing to supply different quantities at different prices with supply functions. Hence, a price at P^* might not give rise to any entry. In essence, additional strategic considerations could lead to potential equilibria that are not sustainable in the sense of contestability theory.

2.3.2 Re-Evaluation of Competition and Contestability Relationship

As an important debate on the concept of contestability, Brock (1983) expresses criticism on the grounds that the price sustainability requirement is too unrealistic. In particular, he

indicated that "costlessly reversible entry needs incumbents to be sluggish relative to challengers and consumers must be quicker to respond to price changes than the incumbents" (Brock, 1983, p. 1065). In this sense, the robustness of contestability theory depends largely on the speed of incumbents' reaction.

Weitzman (1983) indicates that the distinction defined by contestability theory between sunk costs, fixed costs and economies of scale is not clear. In some circumstances, all three may be positively related. If there is no sunk costs, production costs for the market are non-decreasing. Hence, contestability theory can not serve as a general theory of market forms. Weitzman (1983) argues that "a hit-and-run technology makes the firm behave 'as if' it is competitive in a market precisely because the convexity preconditions for competition are de facto being met in that market" (p. 486).

In addition, Macleod (1987) points out that contestability theory has a weakness: "its strategic aspects are not completely worked out" (p. 141). Particularly in a perfectly contestable market, the effects of entry and potential entry depend on the kinds of costs which become sunk on entry. Macleod's study (1987) shows that sunk costs associated with product specific capital do not deter entry and increase the set of possible market equilibria. However, if sunk costs result from the time required to leave a market, they have the opposite effect and can deter entry.

The strongest challenge to contestability theory comes from Shepherd (1984, 1988b, 1990 and 1995). Shepherd (1984) indicates that "the logical possibility that free entry could neutralize internal market power was known from the outset, but it was set aside as an extreme case" (p. 574). Instead, contestability theory imposes a concept of ultra-free entry, in which external conditions are assumed to dominate internal conditions. However, this argument is based on a tautology, that is, "if entry is ultra free, then potential competition effaces actual monopoly by definition" (Shepherd, 1984, p. 579). If competition is effective already, ultra-free entry adds little or nothing to conventional competition theory. But if a monopoly is involved, the entry assumptions are fatally contradictory (Shepherd, 1984). Hence, the extreme assumptions leave ultra-free as a special case, not a useful focal point for a general theory.

Furthermore, Shepherd (1988b, 1990) states that contestability theory is strictly static and not robust. It omits nearly all questions of innovation, of dynamic processes and interactions, and of equity. Using competitive theory, it is possible to examine intermediate degrees of monopoly, by weighing market shares, concentration, pricing and profits. In contrast, ultra-free entry appears to apply only in the pure case, where the highly restrictive assumptions hold perfectly. More seriously, Shepherd (1990) further questions the origin of contestability theory and the incentive of its founder, "because the contestability study was sponsored, directly or indirectly, by large US companies, which were resisting antitrust challenges" (p. 18).

Another weakness of contestability theory is "to misplace reality, by claiming that potential competition has primacy over actual competition" (Shepherd, 1995, p. 302). This viewpoint was also shared by Dasgupta and Stiglitz (1988). They point out that "if there are even small sunk cost, potential competition may not be effective in ensuring either that profits go to zero or that efficient outcomes are obtained" (Dasgupta *et al.*, 1988, p. 571). While there is no clear relationship between potential competition and economic welfare, the relation between potential competition and actual competition is also complex.[7]

On the other hand, Schwartz (1986) proposes that "the key unsettled issues of contestability theory are what is meant by imperfect contestability and whether many actual markets are imperfectly contestable" (p. 37). Small deviations from the conditions are likely to affect substantially the conclusions of the contestability analysis. In reality, sufficient conditions for a perfect contestable market are virtually certain to be violated, at least to some degree. Hence, if a market is only imperfectly contestable, the level of social welfare predicted, using the assumptions of perfect contestability, may be illusory.

[7] There was a suggestion that potential competition would ensure efficiency. "Schumpeter argued that there would be temporary monopolies in each market, and competition would force such high expenditures on R&D that profits would be driven down to zero" (Dasgupta *et al.*, 1988, p. 570). To Schumpeter, dynamic efficiency was far more important that the static efficiency (Dasgupta *et al.*, 1988).

In addition to the criticisms listed above, there have been a number of theoretical works on contestable markets and relevant subjects. Some studies focus on investigating what forms of game and what models of dynamic strategic oligopoly yield outcomes consistent or inconsistent with contestability (see for example, Brock 1983; Mirman *et al.* 1985; Grossman, 1986). Baumol *et al.* (1982) argue that oligopolistic interactions are avoided in the presence of perfectly reversible and frictionless entry. This argument is based on the assumption that entrants enter the market in the expectation that incumbents' prices remain fixed. It seems that "incumbents are forced to price competitively as the outcome of some game between incumbents and potential entrants, provided that entry is costlessly reversible" (Brock, 1983, p. 1059). But there is no precisely defined game in the Baumol Group's work (1982). To define a perfectly contestable market, Mirman *et al.* (1985) design a game in strategic form that yields static equilibria where outputs are produced by a single firm, monopoly profits are zero, and equilibrium prices are sustainable. It shows that the equilibria by threat of entry may appear in the repeated game only if a small amount of asymmetric information in firms is present.

Moreover, Applebaum and Lim (1985) develop a model in which the degree of contestability is endogenous. In view of demand uncertainty, the degree of contestability is determined by the incumbent's incentives to commit to quantity-determining capacity. In the same line, Cairns (1996) examines the consequences of potential entry under uncertainty in the type of one-period model. The equilibrium under uncertainty coincides with that under perfect contestability. Nevertheless, this equilibrium is not robust "to the introduction of even a small degree of uncertainty on the part of the potential entrant" (Cairns, 1996, p. 130).

Although some have questioned contestability's theoretical and empirical applicability, contestability theory has come to be established as one of the main paradigms of industrial organization, its relevance to be decided by empirical tests of its predictions (Gilbert, 1989). Indeed, the concept of contestability is not so "revolutionary and path-breaking" as the authors originally claimed (Baumol *et al.*, 1982, p. 2). In contrast, it does not render the traditional theoretical tools obsolete. Consequently, it supplements industrial organization theory with a new device specializing in the possible sources and performance implications of competition.

2.4 Empirical Tests on Competition and Contestability

The empirical studies relating to contestability theory encompass a wide range of industries, including banking, rail, truck, insurance, and a number of others. The empirical literature could be divided into three groups: 1) econometric studies accompanying contestability analysis, 2) market simulation studies testing various attributes of contestability, and 3) case studies in the regulatory and antitrust arenas, which rely explicitly on the theory of a perfectly contestable market. A "Conjectural Variations" model is also interpreted and discussed for the use in empirical investigation of market conduct. Finally, empirical literature on the liner shipping industry will be reviewed in the last sub-section.

2.4.1 Empirical Studies

There have been a number of industry studies seeking to test whether the area of the economy under investigation can be classed as a contestable market. For instance, some studies focus on tests of the contestability of the airline industry. Bailey and Baumol (1984) assert that the structural conditions in the airline market are conducive to contestability. In contrast, Formby *et al.* (1990) provide a significant, positive correlation between concentration and profits in airline markets, thereby refuting the proposition of perfect contestability.

Furthermore, Morrison and Winston (1987) argue that airline markets are not perfectly contestable but are imperfectly contestable. Specifically, the number of actual competitors on a route and the number of potential competitors are employed as explanatory variables. Morrison and Winston (1987) declare that, while perfect contestability predicts no variation in the performance variable, imperfect contestability could allow for variation. As the results show both coefficients to be statistically significant, it is interpreted that the airline industry is not perfectly contestable but is imperfectly contestable.

Peteraf (1995) summarizes the current studies on the airline industry and indicates that "it is well established that airline markets are not perfectly contestable" (p. 289). In practice, actual

competition has been found to have a substantial effect on market performance, in contrast to the predictions of contestability theory. In the sense that potential competition has some effect on market performance, he also argues airline markets as being "imperfectly contestable". While the results of this study are consistent with "imperfect contestability", they are also consistent with more traditional models, such as limit pricing, as well (Peteraf, 1995).

In addition, Nathan and Neave (1989) examine the competitiveness in the Canadian banking, trust company, and mortgage company industries, using cross-section data in the early 1980s. The data reject the hypothesis of monopolistic or oligopolistic behaviour in any of the three industries examined. Since asset concentrations in Canada's financial system do not seem to be decreasing, financial industry concentration impairs its competitiveness (Nathan *et al.*, 1989). This result supports the view that parts of Canada's financial system exhibit characteristics of contestability.

2.4.2 Simulation Studies

A number of papers using experimental simulation of market behaviour provide some interesting investigations on contestability issues. Harrison and McKee (1985) use experiments to test whether complete freedom of entry and exit could guarantee a market to be most cheaply served by only one firm. It shows that, if there are substantially decreasing costs, approximately competitive behaviour by a single firm is observed. Further, Harrison *et al.* (1985) test the effects of imposition of the Bertrand-Nash assumption that entrants take the incumbents' prices to be given. As a consequence, satisfaction of the Bertrand-Nash assumption is associated with a dramatic decline in monopoly trading effectiveness. The experiments strongly support the contestable markets hypothesis. They conclude, "...[w]e find support for a strong form of the contestable market hypothesis that claims that observed prices will converge to and attain competitive predictions" (Harrison *et al.*, 1985, p. 66).

Nevertheless, as Schwartz (1986) argues, "Harrison's experiments basically do constitute a fair test of behaviour under perfect contestability. The real question, however, is not whether competitive results will emerge under perfectly contestable conditions but how often such conditions are likely to exist and what happens when they do not" (p. 52). Hence, it is

essential to conduct statistical or experimental investigation to confirm that imposition of Bertrand-Nash behaviour leads to the results predicted by contestability theory.

2.4.3 Policy Studies

As the Baumol Group (1982) states, contestability theory aspires to offer two types of guidance to policy makers: 1) it undertakes to provide criteria to distinguish the cases in which government intervention is desirable from those in which it is not; and 2) it seeks to offer tools to the regulators that will increase the public welfare benefits of intervention (p. 499). Contestability theory maintains that, if an industry behaves as if it is contestable, most of the benefits of perfect competition can be obtained without government intervention. In this sense, "direct regulatory attempts to impede entry or exit or to interfere with the timing or manner of entry must be examined severely" (Baumol *et al.*, 1982, p. 501).

Notably, Bailey and Baumol (1984) present evidence on aviation deregulation corresponding well to contestability theory. In the meantime, they indicate that the pure theory of contestable market is an analysis of equilibrium conditions. In reality, however, many of the assumptions underlying static equilibrium theory simply do not hold true. Hence, the application of contestability theory should be precisely "a case-by-case analysis that takes into account ease of entry and exit as well as scale effects within markets" (Bailey and Baumol, 1984, p. 133).

2.4.4 Conjectural Variations

Brander and Zhang (1990) point out that contestability studies are concerned with market conduct, at least implicitly. In their airline industry study, they conduct an explicit estimation of conduct parameters by using a "conjectural variations" model. The concept of conjectural variations dates back to Bowley's work (1924). The idea, simply, is that a firm in an oligopolistic market believes that the quantity (price) it chooses will affect the quantities (prices) chosen by its rivals. The reactions of the rivals to the quantity (price) decision of firm X_1, as subjectively perceived by firm X_1, is called "conjectural variation" (Kamien *et al.*, 1983, p. 191).

This model has been criticized by Friedman (1977, 1983), with several arguments against conjectural variations analysis in static models: 1) the models are not actually dynamic, thus a dynamic interpretation is not possible; 2) the firms are assumed to maximize one-period profits rather than a given planning horizon; and 3) firms have expectations about how their rivals will behave that need not be correct (Friedman, 1983, p. 110).

Recently, many economists argue that the conjectural variation is simply a useful and intuitive summary measure of market conduct (Brander and Spencer, 1985; Dixit, 1988; Dockner, 1992). The estimated magnitude of conjectural variation can be used to "address the question of whether the industry is consistent with the Bertrand model or with the cartel model, or Cournot model" (Dixit, 1988, p. 183). Further, Dockner (1992) explores the relationship between dynamic oligopolistic competition and static conjectural variations equilibria. He finds that the steady state perfect equilibrium of the dynamic game can be viewed "as a conjectural variations equilibrium of the corresponding static game" (Dockner, 1992, p. 390). Thus, to some extent a static conjectural variations analysis approximates long-run dynamic interactions.

2.4.5 Empirical Studies in Shipping

Liner shipping activities have been presented as an exemplary field for application of contestability theory (Davies, 1986a, 1986b and 1989; Frank and Bunel, 1991). The main arguments in favour of contestability are the following: 1) entrants and incumbents have the same access to technology; 2) sunk costs are very low: container ships are now standardized and may be easily diverted from one route to another; 3) there are many potential entrants, such as tramps, conbulkers, in liner shipping markets; 4) conferences are traditionally slow to react to new entry, and the prevalence of loyalty contracts in liner shipping; and 5) potential entrants look for long-term contracts with shippers, with emphasis on finding enough cargo for entry. Davies (1986b) concludes that the Canadian liner shipping market exhibits the characteristics above listed, and "closely matches the requirements of the extreme, ideal, perfectly contestable market" (p. 310).

In addition, Young (1996) designs a three-player game to consider the competitive effects of exclusive dealing contracts in ocean shipping. In this game, the entrants are more efficient than the incumbent, but capacity is constrained. The focus is on the capacity asymmetry of the incumbent and entrants. The results show that exclusive dealing contracts may represent an effective entry barrier. It implies that the incumbent is able to exclude the smaller entrant from the industry. As exclusive dealing contracts are a common practice in the ocean shipping market, capacity is an important consideration. In particular, "given the prevalence of loyalty contracts in liner shipping, this model predicts that many smaller lines will be excluded from the market" (Young, 1996, p. 126). In other words, it means that successful entry in the liner shipping market must be of a fairly large scale. This conclusion is supported by Davies's empirical work (1986b). In the case of Canadian liner trades, Davies (1986b) indicates that the size of entrants is fairly large in terms of cargo volumes transported.

2.5 Summary

This chapter discusses how economists have attempted to evaluate effective competition and contestability. A number of deficiencies and difficulties discussed explain the ambivalent attitude taken by the economics profession toward contestability theory. Inaccuracy of data used in the analysis, and rigid and unrealistic assumptions underlying estimated models have been considered to be the major factors obscuring the effectiveness of competition and contestability in industry studies.

Some implications can also be drawn from this chapter. First, a detailed industry study, both descriptively and normatively, is necessary for the analysis of competition and contestability. Moreover, there is a need to use tools, specifically a "conjectural variations" model, to analyze the kinds of strategic behaviour that could lead to the outcomes predicted by contestability theory. Given these findings, an empirical analysis of trans-Tasman liner shipping industry is examined in Chapter Four and Five. The next chapter presents an overview of trans-Tasman liner shipping industry in order to provide the background for a competition and contestability analysis.

CHAPTER THREE

An Overview of Trans-Tasman Liner Shipping Industry

> *Every person who shall monopolize, or attempt to monoplize, or combine and conspire with any other person or persons, to monopolize any part of the trade or commerce ..., shall be deemed guilty of a felony.*
> _ Sherman Antitrust Act of 1890.

3.1 Introduction

The purpose of this chapter is to provide an overview of trans-Tasman liner shipping industry. Regular shipping services across the Tasman began in the 1850s. In 1996, about 85 per cent of trans-Tasman trade by value, and over 99 per cent by volume, was carried by ship. Liner shipping provides regular scheduled services for containers and non-bulk freight, such as timber and cars. In the 1990s, trans-Tasman liner shipping accounts for over three quarters of trans-Tasman sea trade by value (NZ Official Yearbook, 1997).

This chapter examines recent developments following the waterfront reform in Australia and New Zealand. It also examines current policy and regulatory frameworks. It provides a descriptive statistical analysis of trans-Tasman liner shipping to set the scene in a broad context before drawing some implications for the contestability analysis, which is the main focus of this study.

This chapter is set as follows. Section 3.2 reviews trans-Tasman liner shipping industry from a historical perspective. The overall maritime policy and regulatory framework of both sides of the Tasman are discussed in Section 3.3. Particular emphasis is placed on the impacts of the "maritime accord" on liner shipping industry. Finally, Section 3.4 provides a summary and sheds an insight on the current developments of trans-Tasman liner shipping industry.

3.2 Trans-Tasman Liner Shipping Industry: A Historical Review

Ocean liner shipping is a regularly scheduled service on established ocean routes between countries or areas. Liner ships carry primarily manufactured goods that are relatively high in value. The trans-Tasman liner trade may be characterized as a short, relatively low volume trade route. It is able to support only a handful of efficient, dedicated shipping lines (different from cross-traders, dedicated operators normally only operate vessels in trans-Tasman market). Despite low cargo volumes, shippers expect a relatively high service frequency in this market. In the past, institutional barriers prevented the employment of foreign-flag cross-trading vessels, leaving the trans-Tasman trade to Australian and New Zealand registered and crewed vessels only.

3.2.1 The Modern History of the Trans-Tasman Trade

The modern history of the trans-Tasman trade is closely linked with that of Union Shipping. Formed in 1875 by Dunedin (NZ) merchants, Union Shipping began a trans-Tasman service, linking Port Chalmers with Sydney via North Island ports, in early 1877 (Trace, 1992, p. 90). In the 1880s, Union Shipping began a regular service: commencing in Melbourne, vessels called at Hobart, Bluff, Port Chalmers, Lyttelton, Wellington, Napier, Gisborne, Tauranga, Auckland, and Russell, before recrossing the Tasman Sea to Sydney. The same port calls were made on the return voyage. In order to create a dominant position in the New Zealand coastal and trans-Tasman trades, Union Shipping pursued an aggressive strategy of merger and takeover in the late 19th and early 20th century. For instance, Union Shipping purchased shares in the competing coastal cargo operator Canterbury Steam Shipping Company in 1904. It also held shares in Anchor Shipping, Opouri Shipping, and Richardson & Company. In addition, Union Shipping signed a number of agreements with its competitors to "assure mutual observance and protection of interests" (Trace, 1992, p. 91).

In the late 19th century, the major competitor of Union Shipping in the trans-Tasman trade was Huddart Parker. It extended the competition by introducing two new vessels into the trans-Tasman trade. Union Shipping chose to retaliate by entering the Australian coastal shipping market. Finally in 1895 Union Shipping conceded Huddart Parker a share of the

trans-Tasman business. As a consequence, the two companies operated a pooling agreement across Bass Strait. This new co-operative working agreement signalled the demise of competition across the Tasman.

Entering the 20th century, the British-owned Peninsular and Oriental Steam Navigation Company (P&O) took over Union Shipping in 1917. This relationship remained for over fifty years. During the inter-war years, Union Shipping operated both passenger and cargo vessels in the trans-Tasman, as well as Australasian coastal trades and the Pacific Islands trades. Following the Second World War, Union Shipping began a phased withdrawal from trades other than the trans-Tasman and Australasian coastal. In 1971 P&O sold Union Shipping to Tasman Union, a holding company owned on a 50:50 basis by Australian and New Zealand interests (Trace, 1992. p. 92).

Following the First World War, Union Shipping held an effective monopoly over the trans-Tasman trade for over fifty years. However, in the 1970s the Australian National Line (ANL) started to enter the trans-Tasman market. At the beginning of its entry, ANL only offered limited capacity across the Tasman as part of its round-the world service. This was owing to a New Zealand waterfront ban on working any non-New Zealand crewed vessel engaged in the trans-Tasman trade. In the later 1970s, two large shippers, BHP and Tasman Pulp and Paper, decided to ship a large proportion of their cargoes in their own vessels. These entries had a rather limited impact on Union Shipping's control over the trans-Tasman liner trade. In 1980 Union Shipping's market share was 92 per cent.

There were, however, some significant changes in the trans-Tasman liner shipping industry in the 1980s. Pacific Forum Line entered the trade in 1981. ANL entered into a joint venture with New Zealand Line (NZL) in 1983, operating a dedicated service in the trans-Tasman liner market. In addition, as a "Non-Vessel Operating Common Carrier" (NVOCC),[8] Oceanbridge Shipping entered the eastbound trade by utilizing extra capacity on Tasman Pulp and Paper vessels. In 1984 BHP started to offer a westbound liner service. Tasman Express Line (TEL) introduced a full container service in 1985. As a consequence of these

[8] A non-vessel operating common carrier (NVOCC) provides liner shipping services but does not own or operate vessels. NVOCCs charter space from other firms.

new entries, the market share of Union Shipping in the trans-Tasman liner trade declined to about 60 per cent by 1987.

Up until June 1991, New Zealand Line (NZL) operated one vessel, *New Zealand Mariner*, between two ports in Australia and three in New Zealand. After the New Zealand government, the owner of NZL, sold it to a subsidiary of P&O Containers Ltd., NZL withdrew the ship from its trans-Tasman operation in July 1991. But it was still involved in the trans-Tasman trade through a slot chartering agreement with its partners (that is, it chartered space for its cargoes on its partners' ships). In early 1992 another New Zealand firm, South Pacific Shipping (SPS), began a trans-Tasman service and operated two vessels between Sydney, Melbourne, Auckland, Wellington, Nelson, Lyttelton and Bluff.

During the early 1990s, there were two agreements registered under Part X of the Australian *Trade Practices Act* for the trans-Tasman liner trade. One is called the Trans-Tasman Shipping Consortium which comprises Union Shipping, TEL, NZL (replaced by SPS in 1993), and ANL (since February 1992). The other is the joint service agreement between ANL and Pacific Forum Line, but it only applies to Brisbane cargoes. BHP, Oceanbridge and Pacific Forum Line each acted independently in the trans-Tasman shipping market.

During 1995, seven Australasian liner shipping companies operated across the Tasman sailing to four Australian ports (Adelaide, Melbourne, Sydney and Brisbane), and eight in New Zealand (Onehunga, Auckland, Tauranga, Napier, Wellington, Nelson, Lyttelton and Port Chalmers). A typical trans-Tasman voyage calls at two Australian ports (Melbourne and Sydney) and three or four in New Zealand (Auckland, Tauranga, Wellington, and Lyttelton). In 1991 there were 979 port calls, 364 in Australia and 615 in New Zealand (BTCE and MOT, 1992). With one major exception, nearly all trans-Tasman non-bulk freight and containers are carried by these seven Australasian liner firms over the 1990s. The exception is the Tasman Pulp and Paper Company which exports forest products, mainly timber, from New Zealand to Australia on its own ships.

3.2.2 The Structure of the Trans-Tasman Trade

The trade between Australia and New Zealand has signficantly increased during the last two decades of the 20th century (see Table 3.1). However, while cargo flows across the Tasman have grown, the volume of cargo remains insufficient compared to the capacity of liner firms. In 1980 three firms (Union Shipping, ANL, and Maritime Carriers) operated nine cargo liners across the Tasman, six of which were employed for the dedicated services. By 1990, seven firms operated thirteen vessels in the trade. Two were Australian based (Australian National Line and BHP Transport), and four were New Zealand based (Union Shipping, Tasman Express Line, Oceanbridge Shipping and New Zealand Line). The seventh, Pacific Forum Line, owned by 12 member governments of the South Pacific Forum including New Zealand, operated two New Zealand crewed ships in the Tasman and provided liner services between Brisbane and Auckland.

Table 3.1 Trade With Australia ($NZ millions)

	1986	*1988*	*1990*	*1993*	*1996*
Exports (FOB)	1,821.8	2,073.8	2,980.2	3,785.6	4,207.0
Imports (CIF)	1,898.0	2,468.3	3,257.3	3,747.3	4,964.0

Source: New Zealand Official Yearbook, 1997.

As Trace (1992) indicates, the trans-Tasman liner trade is notable for a high level of seller concentration, normally associated with the presence of economies of scale (p. 93). Nevertheless, while economies of vessel size are a major determinant of concentration in many shipping markets, they are less important in a relatively short sea trade, such as the trans-Tasman trade. Generally, for any given set of factor prices, the longer the trade route and the greater the speed with which cargo can be handled, the larger the optimal size of ship. In short sea trade, the ratio between time spent in port and time spent at sea is relatively high, militating against the employment of large vessels (ibid, p. 93).

On major deep-sea routes, for instance, the trans-Pacific and Europe-Far East, container-ships employed have increased in size from 2,000 TEU (Twenty-foot Equivalent-container Unit) in the late 1960s to 5,000-6,000 TEU in the 1990s. On the contrary, in the trans-Tasman trade, the largest specialized container vessel currently employed is the 1034 TEU,

Tranztas Trader, which is operated by BHP. The continuing presence of relatively small vessels suggests that economies of vessel size are relatively unimportant in the trans-Tasman trade. For instance, in 1996 Tasman Express Line (TEL) replaced its trans-Tasman fleet with two new container vessels, *Wellington Express* and *Sydney Express*, each with only 370 TEU capacity.

A 1992 survey, which was conducted jointly by the Australian Bureau of Transport and Communications Economics (BTCE) and the New Zealand Ministry of Transport (MOT), introduced shipper preference in the trans-Tasman trade. To rank in order of their preference, four possible improvements to trans-Tasman shipping are in demand: increased frequency, lower freight rates, improved reliability, and faster transit times. Shipper preference for a frequent service also favours small vessels in the trans-Tasman trade (BTCE and MOT, 1992).

On the other hand, economies of scope, offering cost savings through the joint utilization of resources, are significantly characteristic of the trans-Tasman shipping operations. For instance, Pacific Forum Line incorporates a trans-Tasman service (Auckland-Brisbane) into its Australia-South Pacific service. Oceanbridge offers a liner service using the "backhaul" capacity on Tasman Pulp and Paper vessels. As a long established operator in the trans-Tasman trade, Union Shipping currently operates three roll-on roll-off vessels. The vessels provide containerized freight services, and also handle timber, pulp and paper, and cars (eastbound only).

Furthermore, the trans-Tasman trade is characterized by the presence of many small shippers. In the 1970s and early 1980s, shippers appeared to have limited influence over liner firms, mainly due to the monopoly power of Union Shipping. Entering the 1990s, most exports are no longer controlled by the Boards. Particularly in New Zealand, the Board shipping regime has been broken up. Liner firms currently deal with many individuals, all of them handling varying quantities. However, a relatively limited number of large shippers still hold major bargaining power in the trans-Tasman trade. As the 1992 survey indicated, "the largest 65 Australian exporters accounted for 64 per cent of the eastbound trade, while the

largest 35 New Zealand exporters shipped 43 per cent of westbound liftings" (BTCE and MOT, 1992, p. 154).

3.3 Policy and Regulatory Framework in the Trans-Tasman Liner Trade

As the trans-Tasman shipping trade is one component of the international shipping trades of Australia and New Zealand, the overall maritime policy and regulatory framework of both countries are directly applicable to the Tasman trade. Also, as with Australia and New Zealand's other international trades, there are now no government laws or regulations that prevent the participation of foreign flag ships in the trans-Tasman trade. It is in theory, if not in practice, an open trade. This section discusses the policy and regulatory frameworks, including recent developments and structural problems in respect of both countries' shipping and waterfront reform programmes.

3.3.1 The Maritime Accord

The Australian and New Zealand Governments agreed in 1990 to review trans-Tasman shipping policy as part of the 1992 full review of the Closer Economic Relations Trade Agreement (CER). A report, *Monitoring of Trans-Tasman Shipping*, prepared by the Australian Bureau of Transport and Communications Economics (BTCE) and the New Zealand Ministry of Transport (MOT) was released in June 1992 as part of the review. As this report indicated, "the Australasian crewed vessels monopolize the trans-Tasman liner shipping market has not been achieved by the outstanding commercial performance of the shipping operators involved. Nor has it been achieved through legislative regulation. Rather, foreign crewed vessels are excluded from the trans-Tasman trade by trade union policy and practice" (BTCE and MOT, 1992, p. 5).

Obstacles to the entry of foreign vessels to the trans-Tasman trade can be traced back to 1931. Then, the New Zealand Seamen's Union prevented the Japanese carrier Osaka Shosen Kaisha operating the Japanese crewed vessel, *Brisbane Maru*, on the trans-Tasman route (Trace, 1992). This union action was also supported by waterside workers in Wellington and Auckland. As a consequence, the success of union action led to an informal arrangement, reserving trans-Tasman trade for Australasian crewed vessels, a situation

which remained until the "maritime accord" was signed. In 1974 the Waterside Workers Federation of Australia, the Seamen's Union of Australia, the New Zealand Waterside Workers Union and the New Zealand Seamen's Union signed the "Trans-Tasman Union Agreement" which has become known as the "maritime accord". The maritime accord was subsequently updated in 1988 and is still in force in the 1990s.

The key sections in the 1988 agreement are Clauses 6 and 3. Clause 6 specifies that the unions involved will only consider the use of third country crewed vessels if a suitable Australasian crewed vessel is unavailable (Swan Consultants, 1992, p. 5). It states:

> *"The Unions agree that trans-Tasman trade be retained for New Zealand and Australian manned vessels. Where specialized shipping of New Zealand or Australian ships are unavailable, the Unions are prepared to consider acceptable alternative arrangements"*

Furthermore, Clause 3 of the 1988 agreement specifies that the Unions*: "agree with the principle of the New Zealand and Australian seafarer and waterfront unions sharing growth of trade across the Tasman"*. These clauses have been used to restrict competition for trans-Tasman trade, as noted in a 1987 Review of Trans-Tasman Shipping:

> *"... strong competition among ship operators does not occur on a continuous basis, but rather in short bursts when new lines enter the market. The desire of the new entrant to establish a foothold in the market is a strong inducement to competitive behaviour in the short term, but once it is established in the market the evidence suggests that competitive pressures rapidly diminish and market shares stabilise."* (Federal Bureau of Transport Economics *et al.*, 1987, p. 172)

The monopoly Australasian vessels over the trans-Tasman trade has led to higher freight rates and fostered the development of inefficiencies in shipping operations. McDougall and Sugden (1989), in their analysis of the impact of the maritime accord on the Australian and

New Zealand economies, list three reasons why it leads to higher than necessary trans-Tasman freight rates:

- Australasian crews are more expensive to employ than foreign crews;
- the argeement excludes cross-trader vessels from the trans-Tasman trade. In general, to utilize capacity more fully, cross-trader vessels may be willing to provide a trans-Tasman freight service at marginal cost; and
- the agreement forces shipping operators to maintain enough capacity to meet seasonal peaks in the freight task. It would be cheaper to maintain a smaller fleet and to charter vessels to meet the peaks in demand.

In the late 1980s trans-Tasman shipping posed serious problems for trade in manufactures. In the case of automobiles, Trace (1992) notes that the freight rate charged by Union Shipping was such that Australian automobile producers had no transport cost advantage vis-a-vis Japanese producers in the New Zealand market, in spite of the fact that New Zealand was over 4000 km closer to Australia than Japan (ibid, p. 99).

Table 3.2 **Container Freight Charges From Australia (A$)**

Commodity	Destination	Twenty Foot Unit	Forty Foot Unit
A	New Zealand	1929	3666
A	Philippines	1300	2500
B	New Zealand	2650	not given
B	Japan	1450	not given

Source: "Monitoring of Trans-Tasman Shipping", the BTCE and MOT, 1992.

Table 3.2 suggests that trans-Tasman liner freight rates exceed those for exports to more distant destinations in the early 1990s. A 1992 study, carried out by Swan Consultants (Canberra), also found that the "maritime accord" between Australian and New Zealand unions has restricted competition and resulted in higher than necessary freight rates. It further showed that increased competition would be expected to lead to a drop of at least 15 per cent in liner freight rates (Swan Consultants, 1992).

The New Zealand Government has taken a more forthright stand against the "maritime accord" than its counterpart in Australia. It maintains that New Zealand has legislation which provides for adequate legal remedies to deal with trade union disruptions and the business sector should therefore ignore the accord. The Australian Government has not supported the accord. However, its approach is one which takes into account the Government's involvement with the trade unions in port reform and maintaining a viable shipping line, which ensures to give employment to Australian workers (BTCE and MOT, 1992, p. 15). Recently, the Australian government has committed itself to take action to enforce the law under which the trans-Tasman "maritime accord" was illegal (NZ *Shipping Gazette*, 25/1996).

There have been signs that the "maritime accord" is beginning to be eroded with some cargoes moving across the Tasman in non-Australasian ships. Even in 1995, few in the industry would have talked openly about foreign-crewed "cross-traders" carrying trans-Tasman cargo for fear of causing union retaliation. But now they are less circumspect, loosened up by a new deal between BHP Transport and the Australian Government, which signals that the "maritime accord" is on its last legs (NZ *Shipping Gazette*, 1997, Holiday Issue).

Under this deal nine foreign-crewed BHP Transport ships are allowed to travel an Australia-New Zealand-North America route to carry trans-Tasman cargo. In the meantime, the deal requires BHP Transport to take over the one of the Australian National Line (ANL owned by the Australian government) ships, *Tranztas Trader*, which is a dedicated Australian-crewed trans-Tasman vessel. Moreover, as the New Zealand *Shipping Gazette* (1997, Holiday Issue) points out, cross-traders such as international liner companies Blue Star and Columbus Line, "have been keeping their heads down quietly undermining the accord for more than two years, and avoiding publicity so as not to inflame union reaction" (p. 2).

3.3.2 Shipping Industry Reform

The Australian Government, in co-operation with the shipping industry and maritime unions, has been implementing a process of structural change to reform the Australian shipping industry. In June 1989, the Australian government commenced a comprehensive three-year

programme of reform designed to address the structural inefficiencies of the waterfront industries (BTCE and MOT, 1992). The reform programme comprised:

- overhauling stevedoring employment arrangements;
- pursuing port authority reform in consultation with the states; and
- encouraging competition within the industry.

The comprehensive reform of New Zealand's waterfront since April 1988 has addressed both the administration of ports, and the manner in which labour is employed and used in stevedoring operations (BTCE and MOT, 1992). Moreover, the *Port Companies Act 1988* requires the thirteen harbour boards to each form a port company to own and operate its commercial port facilities. They are required to operate commercially and without regulatory powers. Hence, port companies are able to respond to market demands and supplies. As a consequence, port corporatization has resulted in considerable efficiency improvements in the administration of port facilities.

Furthermore, "the abolition of the Waterfront Industry Commission in 1989 ended over 40 years of direct Government regulation of waterfront employment arrangements, and empowered stevedores and other employers of waterside workers to directly employ their own workforce" (BTCE and MOT, 1992, p. 10). Direct labour savings as a result of the reforms are $58 million a year due to the number of waterside workers being halved from around 2800 to 1400 (NZ Official Yearbook, 1997). Estimates of the savings to shipping lines, exporters and importers in the cargo-handling area since 1989 range from 20 to 80 per cent. The success of the port reforms has been summarized by the NZ *Shipping Gazette* (1997, Holiday Issue), "cargo handling efficiencies increased dramatically immediately after port reform with gang size halved, improvement in ship turn around times of 40 - 50 per cent, handling costs down between 20 and 66 per cent and interface demarcation problems removed or greatly reduced" (p. 12).

Successive New Zealand Governments have placed greater emphasis in their shipping policy on the country's predominant status as a user, rather than as a provider, of shipping services (BTCE and MOT, 1992). This has been reflected by the state's sale of the New Zealand Shipping Corporation within the *Shipping Act*. Another significant change has been the

reform of coastal shipping, which permits foreign liner firms to enter the coastal trade (Cavana, 1995a and 1995b). As a result, coastal shipping real freight rates have dropped dramatically in recent years. For instance, Pacifica Shipping's real freight rates between Auckland and Lyttelton dropped 27 per cent between 1988 and 1992, and New Zealand Rail Ltd's ferry freight rates dropped by 47 per cent in real terms between 1983 and 1992 (Cavana *et al.*, 1997).

Nevertheless, coastal shipping deregulation still remains controversial. Similar to trans-Tasman shipping, only New Zealand registered ships were permitted to move passengers and cargoes between ports along the coast of New Zealand prior to February 1995. After the amended clause (Section 198) in the *Maritime Transport Act* was passed by Parliament, competition from international cross-traders has been introduced to the coastal trade

Since then, as predicted prior to deregulation, the freight rates for containers and freight travelling from the North Island to the South have dropped by up to 40 per cent, due to the extra competition and marginal costing by cross-traders. However, the freight rates for north bound cargo have not changed, since most of the international shipping lines usually travel down the coast in a southern direction before departing from New Zealand. As Cavana (1995b) points out, "the most noticeable effect of coastal shipping deregulation has been the loss for New Zealand operators of some southbound cargo to foreign operators providing low-cost rates between domestic port calls" (p. 163).

3.3.3 Current Developments in Trans-Tasman Liner Shipping Industry

In 1996 the "maritime union accord" appears to be in its death throes, heralding greater competition and a major shakedown in trans-Tasman liner shipping (NZ *Shipping Gazette*, 2/1997). For instance, the Australian Maritime Union (MUA) has agreed to allow BHP's nine cross-trader vessels to carry trans-Tasman cargo in exchange for BHP taking over the dedicated vessel left by the withdrawal of ANL in December 1996. P&O has also introduced Tasman Link, a comprehensive package of door-to-door services including documentation and customs clearance. In 1997 seven liner firms operated fifty-three vessels in the trans-Tasman trade (see Table 3.3). At the same time,

there were at least eight liner firms providing cross-trader services in this market. It is fair to say that the Tasman has never been more competitive.

Table 3.3 **Capacity of Dedicated Operators in Trans-Tasman Liner Shipping**

Operators	*Dedicated Ships*	*Dedicated Capacity*	*Non-dedicated Ships*	*Total Capacity*
Tasman Pulp and Paper	2 Paper carriers	5,000 - 8,000 TEU	Nil.	5,000 - 8,000 TEU
BHP Transport	3 Dedicated Operators	58,000 TEU	9 Cross traders	60,000 - 70,000 TEU
UDL (Union + ANZDL)	3 Dedicated Operators	43,000 TEU	7 Cross traders	50,000 - 60,000 TEU
The Alliance (SPS, TEL, P&ON [a])	8 Dedicated Operators	50,000 TEU	21 Cross traders	120,000 TEU
Total Dedicated Operators	16 Dedicated Operators	**151,000 TEU**	37 Cross traders	**230,000-25,000 TEU**

Note: [a] In September 1996, P&O Containers and Nedlloyd Containers announced that they would merge to form the world's largest sea freight carrier. The new name will be P&O Nedlloyd Container Line (P&ON).

Source: New Zealand Shipping Federation (1997), NZ *Shipping Gazette* (various issues) and personal communication.

The most significant challenge has come from the trans-Tasman liner shipping industry itself. First of all, it came from the merger of Australia New Zealand Direct Line (ANZDL) and Union Shipping. In March 1997 a new company, Union Direct Line (UDL), was formed by the merger of ANZDL and Union Shipping and commenced trans-Tasman services. This development was taking place at a time of considerable change in trans-Tasman liner shipping.

Since the Australian maritime union sanctioned the carriage of trans-Tasman cargoes on the nine BHP cross-trader vessels in 1996, it has been expected that cross-traders will exercise an increasingly important role in the trans-Tasman trade (NZ *Shipping Gazette*, 7/97, p. 2). Compared with dedicated operators, cross-traders have significantly lower crewing costs and are able to set its marginal cost as price. This fact provides them with

a significant cost advantage over those shipping companies which provide dedicated services and employ New Zealand or Australian labour. The leading cross-trader involved in the carriage of cargo in the trans-Tasman trade in recent years has been ANZDL. It currently operates its seven containerships between Auckland, Melbourne and Sydney as one part of its New Zealand/North America trade lane.

Table 3.4 **Trans-Tasman Liner Services and Capacity (TEU)**

	1989-90		1991-92[a]		1996-97[b]	
	Cargo	Capacity	Cargo	Capacity	Cargo	Capacity
Eastbound	41,305	55,587	51,220	90,739	75,000	280,000
Westbound	49,239	55,157	57,260	90,257	60,000	275,000

Note: [a] This column summarizes only the data supplied to BTCE survey. In addition, the non-respondent firms, Oceanbridge and Pacific Forum Line, might have carried 5,000 TEU and the Tasman Pulp and Paper Company ships might have carried 10,000 to 20,000 TEU of westbound trade.

[b] This column includes data estimated by Mr. Ron Longley, Chief Executive of Tasman Express Line (TEL), in his address to the 6th annual Waterfront, Ports and Shipping Conference, 11/12 June 1997.

Calculated from *'Monitoring of Trans-Tasman Shipping'* (1992) and NZ *Shipping Gazette* (various issues).

One feature of the current trans-Tasman trade is that it is significantly over-tonnaged (see Table 3.4). A number of the operators, including Union Shipping, were reported to have incurred financial losses (NZ *Shipping Gazette*, 4/1997, p. 1). Hence, Union Shipping would be expected to reconstruct itself through a merger with its major rival, ANZDL, thereby surviving the intense competition in the trans-Tasman trade.

The other reorganisation came from the recently established trans-Tasman shipping alliance involving P&O Nedlloyd (P&ON), South Pacific Shipping (SPS), and Tasman Express Line (TEL). SPS and TEL each provides dedicated container shipping services on the trans-Tasman trade. At the time their alliance was announced, SPS operated eight container vessels in the trade, while TEL had two. P&ON provides trans-Tasman sailing on twenty-one of its container vessels on a three month cycle as part of its liner shipping services between Australia, New Zealand, Europe, the Middle East, and Asia. However, with minor exceptions, the company has been restricted, until 1997, from carrying trans-Tasman cargo because of the provisions of the trans-Tasman Maritime

Accord. On the other hand, SPS and TEL currently have financial problem in the trans-Tasman trade and need the new arrangement with P&ON for their future survival.

Under the alliance, space will be provided to shippers on a total of 29 vessels operated by the members of the alliance. It also becomes the only trans-Tasman shipping service to operate to all five Australian mainland ports and all eleven New Zealand ports. It is intended that members of the alliance will offer over 500 sailings annually on the Tasman with a total capacity of 120,000 TEUs and over 1,800 port calls a year. In this new arrangement the alliance will on average have a ship sailing from Australia to New Zealand every 16 hours, and have a ship in five Australian or New Zealand ports on any one day (NZ *Shipping Gazette*, 12/97, p. 5).

Moreover, three partners of the alliance will operate as individual identities and there are no common tariffs. The official line of the alliance is that "this is a combination to achieve maximum operational efficiencies and economies of scale for port and stevedoring costs" (NZ *Shipping Gazette*, 12/1997, p. 3). As the Commerce Commission assessed,[9] the establishment of the trans-Tasman shipping alliance will lead to efficiencies in services provided by member companies. The integration of the services of three major shipping companies with interests in the trans-Tasman trade is also likely to result in benefits to shippers through more comprehensive port coverage, and more regular sailings.

3.3.4 Structural Problems in Trans-Tasman Liner Shipping Industry

In general, there are two main impediments faced by the dedicated operators: the direct cost of operating a dedicated service and government imposts. Firstly, not only do dedicated operators have to provide vessels dedicated to the trade, but they also have to provide a full overhead and infrastructure in both countries. The full vessel and voyage costs have to be met by trans-Tasman cargo only.

[9] The Commerce Commission was first constituted under the *Commerce Act 1976*, but New Zealand competition law was heavily amended by the 1986 Act, under which the Commission was reconstituted (Pickford *et al.*, 1995, p. 7).

Moreover, trans-Tasman shippers require a high level of service with a high standard of equipment, "covering all the types of 20' and 40' containers, which include standard, open tops, flat-tracks, high-cubes, bolsters, and reefers containers" (NZ *Shipping Gazette*, 2/1997, p. 6). Consequently, there is a high cost in providing this mix of fleet to cover the full range of port pair options.

In contrast, some cross-traders are simply using the trans-Tasman as a means to position empty containers from one country to the other country. Cross-traders incur no additional vessel and voyage costs, including port costs, with only a marginal increase in their overhead cost. The only real additional cost to cross-traders is the time that the loading and discharging of trans-Tasman cargo takes the vessel away from their main trade by reducing the number of voyages per year, or if they full utilize capacity in their main trade schedules then there is no additional cost (NZ *Shipping Gazette*, 2/1997).

Therefore, dedicated operators have a higher cost structure than cross-traders. Concerning only crew costs, dedicated operators have to meet all of the respective countries' taxes and social costs associated with the employment of Australians and New Zealanders. This results in further additional costs for dedicated operators.

In addition, the cost of government imposts adds even further financial burdens for dedicated operators. Some of these imposts are:

- Tax on crews' salaries. Most foreign crewed vessels are managed from countries which have a very low, or even no tax on crews salaries. This makes up over 30 per cent of crew costs for dedicated operators.
- Tax on profits, GST and ACC. Most international operating vessels are beneficially owned in countries with subsidies or tax concessions for ship owners.
- Non-resident withholding tax on vessels and non-resident withholding container tax. A two per cent tax is applicable on vessels that are chartered in/from countries that do not have a double taxation agreement with New Zealand.

On the other hand, cross-traders not in an arrangement with a dedicated operator do not provide full port coverage to the trans-Tasman trade. Under this circumstance, they

have varying amounts of space available depending on their main trade requirements. Hence, the main disadvantage of the above cross-traders is their lack of port coverage in New Zealand. As a result, nearly all cross-traders only service Auckland. Because of this factor, there is a surplus of space available both in and out of Auckland. This means that freight rates will continue to fall in the Auckland market and could fall to a level below which dedicated operators can not compete.

Furthermore, on the side of trade union, the "maritime union accord" was reviewed in March 1997. This review took into account the developments relating to the involvement of crosstrading vessels. It reflected acceptance by the Maritime Unions on trans-Tasman shipping of commercial realities that now face the dedicated operators. The Maritime Unions have agreed to the introduction of cross-traders working in conjunction with the dedicated operators in the trans-Tasman trade. However, the Maritime Unions remain strongly opposed to any further developments which, in their view, would unfairly prejudice the employment and conditions of Australian and New Zealand Seafarers.

3.4 Summary and Implications

This chapter presents various descriptive statistics of trans-Tasman liner shipping industry, and in particular, current policy and regulatory frameworks. For many years, the carriage of cargo between Australia and New Zealand has been governed by the provisions of the trans-Tasman Maritime Accord (the Accord). In recent years, the Accord has been subject to pressure, and now appears to be breaking up, particularly in the face of increased competition from cross-traders. As a consequence, a considerable change has been seen in trans-Tasman liner shipping.

These findings raise several implications for the analysis of contestability. First, it is important to note the impacts of "deregulation" (breaking the "Accord") on the industry. Second, it is essential to examine the concentration of firms or alliance in market share. Third, due to some specific characteristics of the liner shipping industry, it is necessary to examine the cost and pricing behaviour of firms, thereby providing an

insight into firms' strategic behaviours. The issue of contestability will be analyzed in the next chapter.

CHAPTER FOUR

Market Structure and Performance in Trans-Tasman Liner Shipping: Theoretical Model, Data, And Some Applications

A hypothesis is important if it "explain" much by little.
__ M. Friedman, 1953, p. 14.

4.1 Introduction

Trans-Tasman liner shipping industry has changed dramatically over the 1990s. To consider only capacity, there were 70,000 TEUs and six shipping companies in 1992 (BTCE and MOT, 1992), while in 1997 there are around 230,000 TEUs and fourteen companies, including three dedicated operators and eleven cross-traders. This numerical increase may suggest that, whatever the past performance characteristics of trans-Tasman shipping markets, competitiveness could recently have increased.

Nevertheless, the impacts may be more complicated. For instance, any effects due to increase in numbers of shipping companies might have been offset by decreased numbers of dedicated operators, since there have been quite a few mergers and exits of such firms in the 1990s. Meanwhile, policy makers were aware of a number of theoretical concepts that seemed to have relevance for the shipping industry. But they had not come to a conclusion about whether, for example, traditional concerns over a concentrated industry structure or contestability theory would eventually hold sway.

The task of this chapter is to provide a normative analysis of the significant developments in trans-Tasman liner shipping industry relating to prices, cost structure, entry and routes. Because of non-disclosure of primary data by private shipping firms and the ongoing transition in the industry, it is impossible to provide precise quantitative measures of how the industry currently differs from what it was in the regulated market. Therefore in this chapter, much of analysis of the data focuses on qualitative issues, such as whether the changes observed in the industry's performance indicate an increase in efficiency and

competition and whether changes are consistent with predictions put forward by economists prior to the reform. Data used in this chapter have been collected from published statements of accounts, trade magazines and newspapers, by consulting reports, and through personal contacts with persons involved in the shipping industry and government.

This chapter is organized as follows. Section 4.2 examines the cost structures and pricing behaviours in trans-Tasman liner shipping industry. Section 4.3 explores the increased freedom to enter and exit from the trans-Tasman trade and examines the substantial cost advantages of the new entrants (cross-traders). The final section provides a test of the contestability hypothesis.

4.2 Costs and Pricing in Trans-Tasman Liner Shipping Industry

Unlike the airline industry, which economists have analyzed extensively both during and after regulation, there is relatively little economic research into the ocean liner shipping industry. Liner shipping, in terms of its operational characteristics, is different from most manufacturing industries with regard to the lack of production flexibility. Firstly, the physical output produced by liner companies, namely transportation services, cannot be put into inventory or accumulated for future use. Thus, its marketing experiments become much more risky than those for manufacturing. Secondly, the possibility of a voyage commencing with unsold space may induce extraordinary attempts by the liner companies to attract customers or to steal customers from rivals. In the long term, the persistent existence of unsold space is likely to encourage strategic policies of cargo attraction, such as price differentiation and marketing campaigns. Moreover, in liner shipping, output reductions will simultaneously reduce the quality of the service provided. This is because capacity reductions require the withdrawal of individual vessels and this, in turn, will usually reduce the frequency of service.

4.2.1 Costs and Capacity

To analyze the relationship between unit costs and capacity utilization, it is instructive to initially treat shipping space as a homogeneous single product - TEU (Twenty-foot Equivalent-container Unit). Given this assumption, it is generally accepted that for

container trades, unit costs fall continuously as capacity utilization increases (Davies, 1983, p. 425). The essential reason for this is that the majority of costs in supplying a liner service are fixed.

Liner shipping costs are mainly split into blue-water costs and cargo handling costs. As a consequence of the constant and committed operations in liner shipping, fuel and labour costs, which are ordinarily classified as variable costs, become fixed in the short run. Also as a result of capital intensiveness in shipping, blue-water costs are treated as a fixed factor in the total costs of operating a ship. The only variable costs incurred are those associated with cargo handling costs. While those costs are usually constant per unit, they could be classified as variable with respect to different container status, full or empty. Consequently, this kind of cost structure could be illustrated in Figure 4.1, which shows the relationship between unit costs and load factors for an individual vessel.

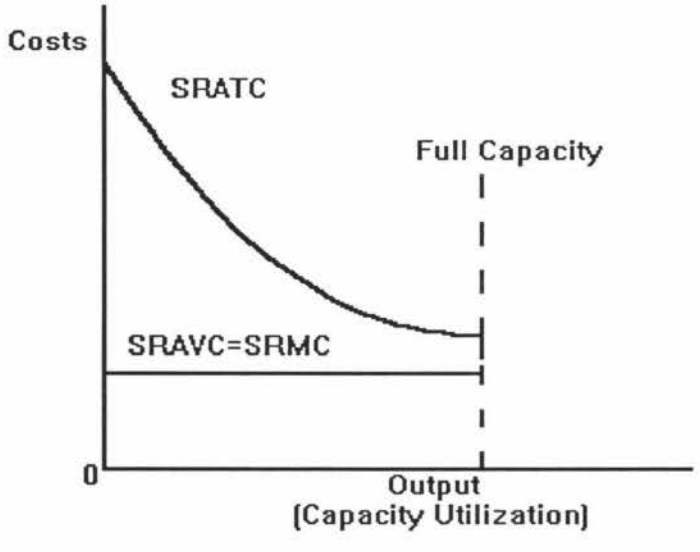

Figure 4.1 Relationship between Unit Costs and Load Factors for a Single Vessel

The implications of this cost structure are as follows. Firstly, unit costs are minimized at full capacity. In addition, costs are significantly sensitive to the degree of capacity utilization. Secondly, short-run average variable costs (SRAVC) or marginal costs (SRMC) are less than average total costs (SRATC) at all utilization levels less than full capacity. The difference between average total costs (SRATC) and average variable

costs (SRAVC) depends on the load factors achieved. At high load factors, with a lot of cargo being carried and therefore substantial total cargo handling costs being incurred, total variable costs (SRAVC) will constitute a large proportion of total costs. Hence, the difference between average total costs (SRATC) and average variable costs (SRAVC) will decline as utilization increases (see Figure 4.1).

Given this cost structure and the role of load factors, Davies (1986) constructs a hypothetical fleet of three ships. As Figure 4.2 illustrates, this model relates short-run and individual-vessel costs to a long-run situation where the fleet could be adjusted.

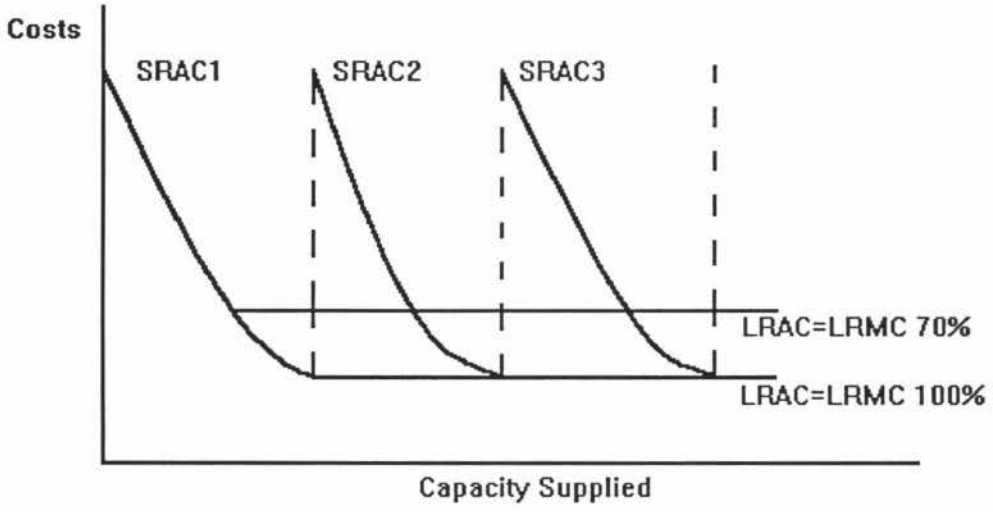

Figure 4.2 Fleet Adjustment and Long-Run Costs

If all ships operated consistently at full capacity then the long-run costs of operating the fleet would clearly be average costs (LRAC) = marginal costs (LRMC) 100 per cent (that is, LRAC=1.0*LRMC, or LRAC=LRMC). However, this situation is impossible under the practical operating conditions of liner shipping. More realistically, if the fleet operated, on average, for example, at 70 per cent load factors, the unit costs incurred would be LRAC=70 per cent of LRMC (that is, LRAC=0.7*LRMC). Consequently, even though the industry may exhibit constant average costs, LRMC is nevertheless a variable whose level is influenced by average sustainable load factor (Davies, 1986, p. 35). More importantly, it indicates that reference to marginal costs is not a sufficient pricing guide in liner shipping. Instead, it is essential to consider the

possible level of average load factors, "which is mainly influenced by the service frequencies offered, capacity indivisibility, reserve capacity and relevant pricing policies" (Davies, 1986, p. 38).

4.2.2 Pricing and Capacity

The pricing of liner shipping, like all pricing, is subject to the forces of supply and demand. However, the variables affecting its supply and demand are unusually numerous. Traditionally, economists have tried to explain the structure of rates in liner shipping in terms of a price discriminating monopoly model (Devanney *et al.*, 1975). This is because a feature of the industry has been the dominance of cartels, known as shipping conferences. However, Gardner (1986) indicates that the existence of a cartel in a trade does not mean that it has complete discretion over price. A shipping conference's discretion over price is limited, "not only by actual and potential competition from independent liner operators, tramp and bulk shipping, air freight operators and land-bridge operators, but also by the fact that there usually exists a potential or actual alternative source of supply for goods traded internationally" (Gardner, 1986, p. 239).

Demand Factors

The demand for liner shipping is derived from the demand for the commodities carried, and is therefore affected by the elasticity of demand for the commodity itself as well as by transportation competition. Fluctuations in the demand for liner shipping services inevitably occur because seasonal and cyclical factors affect the supply of and the demand for many goods moving in sea trades. Moreover, the elasticity of demand for liner shipping is affected by the availability of substitutes for the commodity seeking transportation, as well as by direct competition. Direct competition may come from other shipping firms operating on the same route and from firms operating via other multi-modal gateways.

Consequently, the elasticity of demand for liner shipping varies considerably from one commodity to another, and even for the same commodity it will differ at different times and on different trade routes. For example, if the cost of transportation represents a

small proportion of the total cost, the demand for transport will tend to be price inelastic. On the other hand, if the transportation cost constitutes a large proportion of the total cost then transport demand will tend to be more elastic.

General speaking, the demand factors of liner shipping, like the cost factors, are highly complex and subject to numerous variables (Devanney *et al.*, 1975). In situations of this type, the elasticity of demand is not likely to be obtainable with sufficient precision for the majority of commodities carried. As Marx (1953) states, "even if such information were available, the underlying demand forces from which the demand for transportation is derived are usually subject to fluctuation to an extent which is apt to render meaningless elasticity schedules calculated for a previous period" (p. 19). Hence, one prominent feature of liner shipping is the indeterminate nature of the elasticity of demand.

Supply Factors

In order to survive in the long run, the liner shipping operator must arrange its supply so as to be able to contend successfully with the uncertainties of demand. It has been suggested that firms in liner shipping need to build reserve capacity to meet fluctuations in demand for their services, "thereby retaining the goodwill of their customers and maintaining their market shares" (Gardner, 1986, p. 237). Here, it is important to distinguish the concepts of reserve capacity and excess capacity. There has been some discussions in the literature on oligopoly theory of excess capacity heightening barriers to entry on the supply side, *i.e.*, if incumbents carry excess capacity then as a result, price will exceed the limit price and production will be inefficient (Bain, 1949; Gaskins, 1971). In liner shipping industry, however, the reason of keeping reserve capacity is to keep the quality of shipping services. Given the cost and profit functions above, common sense suggests that it would be most advantageous if vessels could run at 100 per cent utilization as their profits would be maximized and unit costs minimized. Nevertheless, given that on any route cargo volumes could vary substantially from one voyage to another, and "given that ships are not elastic and can not instantaneously adjust their capacity to meet such fluctuating demand, it is not in practice possible consistently to operate with 100 per cent load

factors" (Gardner, 1986, p. 236). Without such reserve capacity, the risks of not being able to lift all cargo awaiting shipment would increase for a liner shipping firm. This in turn could lead to the lose of its goodwill with clients and provide an opportunity for new competitors, thereby jeopardising its future market share.

Furthermore, Gardner (1986) introduces a modified normal-cost model to explain the pricing behaviour of firms in liner shipping. Firstly, given the assumption of no economies of scale and homogenous product/service (TEU) in liner shipping, there is a constant average variable cost (AVC) as shown in Figure 4.3.

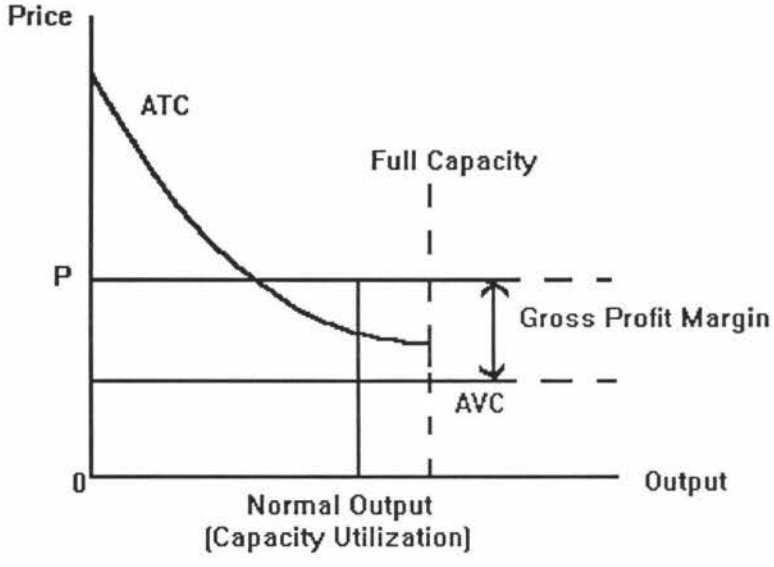

Figure 4.3 The Normal-Cost Pricing Model

As Figure 4.3 illustrates, reserve capacity results in average variable cost (AVC) being constant over the expected range of capacity utilization. Firms will decide prices (P) by adding a mark-up to these costs (AVC). This mark-up, the gross profit margin, will be determined by reference to normal capacity utilization. It will also take account of the possibility of inducing entry since excessive profits are likely to attract entry. In this sense, such prices are cost based and are competitively determined. Moreover, as Gardner (1986) points out, prices "will reflect the long-run opportunity cost of carriage, given that liner shipping operators have to organize their business in the real world to cope with uncertainty and instantaneous capacity adjustments are not feasible" (p. 240).

Furthermore, in order to examine the consequence of relaxing the assumption that there are no economies of scale in liner shipping, a hypothetical numerical example is employed in Table 4.1. A similar approach was used by Evans (1977) to explain the discriminatory rate structure in liner shipping.

Table 4.1 **Costs of Providing Additional Voyage Capacity**

(1) *Normal capacity utilization in measurement (TEUs)*	*(2)* *Total costs (NZ$000)*	*(3)* *Change in total costs (NZ$000)*	*(4)* *Average cost per TEU (2)÷(1) (NZ$)*	*(5)* *Incremental cost per TEU (3)÷(1000) (NZ$)*
100	100	100	1000	1000
200	190	90	950	900
300	270	80	900	800
400	340	70	850	700
500	400	60	800	600
600	450	50	750	500
700	490	40	700	400
800	520	30	650	300
900	***540***	***20***	***600***	***200***
1000	560	20	560	200
1100	585	25	530	250
1200	615	30	510	300
1300	650	35	500	350
1400	690	40	490	400

Calculated from Evans (1977) and Gardner (1986).

Table 4.1 demonstrates the effects of economies in vessel's size on the cost of providing additional voyage capacity. In this example, the cost of providing extra capacity falls initially with each incremental step of 100 TEUs. Hence, it is possible for firms to introduce a large capacity container vessel, thereby offering additional capacity up to the normal capacity utilization of 900 TEUs. If a firm provides a 900-TEU

capacity container vessel, however, at a normal level of capacity utilization (for example, at 500 TEUs), its average voyage losses would be NZ$240,000 as a result of price at NZ$600 per TEU.[10] Thus, commodities carried will be charged at a normal price only if total revenue can bear the cost of total capacity. It may be further argued that "such prices in liner shipping are cost-based as they reflect the marginal cost of providing additional capacity under conditions of uncertainty" (Gardner, 1986, p. 245).

4.2.3 Pricing and Contractual System

One of the most conspicuous features of the shipping industry is the range and versatility of the contractual arrangements that are involved. The commitment to sail at advertised times puts the shipping firm at a strategic disadvantage, because it encourages customers to hold back their cargoes to the last minute in order to negotiate a lower rate. As Casson (1987) indicates, "customers anticipate a low rate because they can see that as the departure time approaches and a margin of spare capacity remains, most of the costs of the voyage are sunk, and so the opportunity cost of taking the marginal consignment is very low" (p. 201).

Consequently, firms in liner shipping encourage customers to take a long-term view by establishing loyalty contracts. Loyalty contracts provide loyalty discounts for customers who do not hold back their cargo or switch it to rival ships. It is effective mainly with respect to producers who regularly trade over the route. In contrast, for occasional customers the shipping firms on the route are more likely to maintain prices at no less than long-run average cost, and to fight outsiders who attempt to undercut prices (Casson, 1987).

In general, loyalty constracts are of two types: deferred rebate and dual rate system. Under the deferred rebate system, shippers who use one firm's services exclusively for two successive periods receive a rebate for the first period at the end of the second period. This practice has been prohibited in a few conturies, such as in the United

[10] In this example, total costs will be NZ$ 540,000, and total revenues will be the amount of the normal capacity utilization (500 TEUs) times the price (NZ$ 600 per TEU), that is, NZ$ 300,000. Thus, the average voyage losses will be NZ$ 240,000 (that is, total revenues - total costs, NZ$ 300,000 - NZ$ 540,000 = NZ$ - 240,000).

States, by the *United States Shipping Act 1916* (Young, 1996, p. 125). The dual rate contract, on the other hand, gives shippers a discount of 10 per cent to 20 per cent off "non-contract" rates. In return, shippers agree not to ship through other shipping firms. If there are contracts between a conference/consortium and shippers, shippers who sign the contract may use the services of any conference firms without violating the terms of contract.

4.2.4 The Trans-Tasman Liner Shipping Case

The data in Table 4.2 indicate the costs structure in the trans-Tasman liner shipping industry in 1992. In general, the share of blue-water costs in total costs would vary depending on the size and type of ship being considered. As Table 4.2 shows, blue-water costs account for around 60 per cent of the total costs of container vessels in the trans-Tasman trade. The monopolistic Australasian crewing levels contribute significantly to the lower competitiveness of Australasian vessels as it accounts for one-fifth of the blue-water costs of container ships.

Table 4.2 **Costs of Operating an Australasian-Crewed Container Vessel**

	$A/TEU	*Share of total costs (%)*	*Share of blue-water costs (%)*
Blue-water costs:			
Crewing cost	209	11.5	20
Capital	198	11.0	19
Fuel	152	8.4	14
Repairs and Maintenance	94	5.2	9
Other: insurance and victualling	417	22.9	29
Cargo-handling costs:			
Stevedoring: -AU	294	16.2	--
-NZ	182	10.0	--
Other shore-based costs	265	14.6	--
Total:	1811	100	--

Source: "Monitoring of trans-Tasman Shipping", Bureau of Transport and Communications Economics, Australia and Ministry of Transport, New Zealand (1992).

An analysis of the existing trans-Tasman fleet undertaken by the Swan Consultants (Canberra) found that crew numbers on Australian and New Zealand vessels could be reduced by one or two crew on average, which could reduce total crew costs by about 7 to 10 (Swan Consultants, 1992). In addition, Australasian crews are highly paid by international standards and have more generous leave provisions. In the shipping industry, foreign crews are estimated to be 50 per cent to 70 per cent cheaper than New Zealand and Australian crews.

The data in Table 4.2 also show that significant inefficiencies still exist on Australia's waterfront. Stevedoring costs in New Zealand were $A 182 per TEU while in Australia they were 62 per cent higher at $A 294 per TEU. This indicates that Australia's waterfront has to undergo further major restructuring before it is as competitive as the New Zealand waterfront.

Table 4.3 **Capacity of Dedicated Operators in Trans-Tasman Liner Shipping**

Operators	Dedicated Ships	Dedicated Capacity	Non-dedicated Ships	Total Capacity
BHP Transport	3 Dedicated Operators	58,000 TEU	9 Cross traders	60,000 - 70,000 TEU
UDL (Union + ANZDL)	3 Dedicated Operators	43,000 TEU	7 Cross traders	50,000 - 60,000 TEU
The Alliance (SPS, TEL, P&ON)	8 Dedicated Operators	50,000 TEU	21 Cross traders	120,000 TEU
Total Dedicated Operators	16 Dedicated Operators	**151,000 TEU**	37 Cross traders	**230,000-25,000 TEU**

Calculated from New Zealand Shipping Federation (1997), NZ *Shipping Gazette* (various issues) and personal communication.

The capacity in trans-Tasman liner shipping include two parts: capacity of dedicated operators and cross-traders. The total realistic capacity of cross-traders is about

30,000 TEU eastbound and 25,000 TEU westbound (NZ *Shipping Gazette*, 2/1997). The capacity of dedicated operators is shown in Table 4.3.

While cargo flows across the Tasman have grown dramatically over the last two decades, the volume of cargo remains insufficient compared to the capacity of liner firms. In 1996 there were approximately 75,000 TEU eastbound from Australia to New Zealand, and 60,000 TEU westbound from New Zealand to Australia. This means that the total annual demand is approximately 135,000 TEU. In this respect, there has been an extreme over-supply in this market.

The freight rates in trans-Tasman liner shipping have displayed major reductions over the 1990s (see Table 4.4). As the NZ *Shipping Gazette* (6/1997) indicates, "the average freight rate for eastbound and westbound, general and reefer, containerized cargoes has reduced by 40 per cent in the last five years" (p. 4).

Table 4.4 **Freight Rate Indices: 1975=100**

Rates	*1975*	*1980*	*1985*	*1990*	*1993*	*1997*
New Zealand to						
Australia	100	274	479	542	434	380 [a]
Japan	100	182	237	350	n.a. [b]	n.a.
UK	100	215	350	459	n.a.	n.a.
US (East Coast)	100	184	299	286	n.a.	n.a.

Note: [a] This column includes data estimated by Mr. Ron Longley, Chief Executive of Tasman Express Line (TEL), in his address to the 6th annual Waterfront, Ports and Shipping Conference, 11/12 June 1997.

[b] Not available.

Calculated from *"Monitoring of trans-Tasman Shipping"*, Bureau of Transport and Communications Economics, Australia and Ministry of Transport, New Zealand (1992); and NZ *Shipping Gazette* (various issues).

The drop in freight rates has mainly occurred for two reasons. First, the bargaining position of shippers has been strengthened. Second, and more important, is the threat of international competition and the current involvement of cross-traders in the trans-Tasman trade. On the other hand, indirect competition comes at the level of shippers (customers). Because many of the shippers compete in world markets, transport or

logistics services provided in the trans-Tasman trade will directly affect shippers' abilities to compete globally. Consequently, the entire shipping industry recognizes the intensity of competition.

4.3 Entry and Exit in the Trans-Tasman Liner Trade

For many years of this century, the carriage of cargo between Australia and New Zealand has been governed by the provisions of the "Trans-Tasman Maritime Accord" (the Accord). Under the Accord, the Maritime Union of Australia and the New Zealand Seafarers' Union have agreed that the transportation of cargo in the trans-Tasman trade be limited to vessels crewed by either Australian or New Zealand nationals. It reflects the fact that Union shipping enjoyed its monopoly in this market for nearly a century until the 1970s, when ANL entered into the trans-Tasman trade (see Table 4.5). As the bilateral trade between Australia and New Zealand soared from $NZ 1,298 million in 1979 to $NZ 8,786 million in 1995 (NZ Official Yearbook, 1984 and 1997),[11] the demand for shipping services increased dramatically as well. Consequently, in total twelve entrances and nine exits have been observed in the last two decades (see Table 4.5).[12]

Before 1995 foreign-crewed vessels were blocked out from the trans-Tasman trade by the Accord. Since then, a number of cross-traders have offered, to a greater or lesser extent, the trans-Tasman services (see Table 4.6). It is difficult to judge the amount of capacity that cross-traders provide on an annual basis because it is variable. The estimated amount is about 30,000 TEU eastbound and 25,000 TEU westbound. However, it is important to note that nearly all cross-traders service only Auckland in New Zealand. The only exception is the Bluestar and Columbus Services, which call at Wellington and make alternate vessel calls to Port of Chalmers.

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[11] Valuation for 1979 is current.

[12] The exit figures, it should be emphasized, include services that ceased completely and those which transferred to new group by merger or alliance.

Table 4.5 **Entry and Exit of Trans-Tasman Liner Services (Dedicated operators)**

Operators	Commenced	Terminated
Union Shipping [a]	1875	Merger
The Australian National Line (ANL)	1974	1996
Maritime Carriers NZ Ltd	1978	1982
BHP Transport	1978	
Tasman Pulp and Paper [b]	1978	
Pacific Forum Line [c]	1981	
New Zealand Line (NZL)	1983	1993
Oceanbridge [b]	1983	
Tasman Express Line (TEL)	1985	Alliance
Seaglen	1990	1991
South Pacific Shipping (SPS)	1992	Alliance
Australia New Zealand Direct Line (ANZDL) [a]	1995	Merger
P&O Nedlloyd (P&ON)	1997	Alliance

Note: [a] Union Shipping and ANZDL was merged to form a new shipping line, Union Direct Line (UDL), on March 1, 1997.
[b] Oceanbridge operated as a "non-vessel owning common carrier" (NVOCC), chartering space on Tasman Pulp and Paper's vessels.
[c] Pacific Forum Line (PFL) provides only services from Brisbane to New Zealand ports as a part of its Southern Pacific Islands Services. The amount of its trans-Tasman service is very little.

Source: NZ *Shipping Gazette*, various issues.

Table 4.6 **Entry and Exit of Trans-Tasman Liner Services (Cross-traders)**

Operators	Commenced	Terminated	Type of service
Blue Star	1995		Eastbound and Westbound
Columbus Line	1995		Eastbound and Westbound
Barbican Line	1995		Eastbound
Pacific Int'l Line [a]	1997	1997	Eastbound and Westbound
Wilhelmsen Line	1996		Westbound
Fesco	1996		Eastbound and Westbound
Contship Eagle	1996		Eastbound and Westbound
OSCL	1996		Westbound

Note: [a] Under union pressure Pacific International Line (PIL) has decided to pull out of the NZ-Brisbane run where its cross-trading activites have been firmly opposed by the New Zealand and Australian maritime unions (NZ *Shipping Gazette*, 28/1997).

Source: New Zealand *Shipping Gazette*, various issues.

4.3.1 Impact of Competition on Shipping Cost Structures

At a popular level the argument is simply that increased competition on the trans-Tasman trade would be expected to force the shipping industry to optimize its cost structure, thereby improving its productivity.[13] Improving labour productivity would flow from: (1) the achievement of international best practice crewing levels; and (2) adoption of international crew to berth ratios (Swan Consultants, 1994, p. 4). In addition, with the competition posed by foreign competitor (cross-traders), dedicated operators have to make further savings in overheads and in the use of capital through better utilization of vessels and containers. The achievements of these savings would be essential if the Australasian vessels want to remain competitive in the face of competition of cross-traders.

Furthermore, as cross traders enter trans-Tasman liner markets, there are no additional vessel and voyage costs incurred, with only a marginal increase in their overhead cost. The only cost to the cross traders is "the time that the loading and discharging of trans-Tasman cargo take the vessel away from their main trade by reducing the number of voyages per year, or if they have enough in their main trade schedules then even there is no additional cost" (Longley, 1997, p. 4). In their 1992 analysis of trans-Tasman shipping, the BTCE and MOT estimated costs faced by cross-traders. Marginal costs for general cargo (manufacturing products) might vary significantly depending on the service offered (see Table 4.7).

Table 4.7 **Marginal Costs of Trans-Tasman Cross-Traders ($A per TEU)**

North Europe/NZ (East Only)	North Europe/ANZ via Mediterranean (East Only)	West Only	Both Ways (Average)
603	**702**	**1,584**	**1,340**

Source: *"Monitoring of trans-Tasman Shipping"*, the BTCE and MOT (1992), p. 61.

[13] This argument lies at the centre of Leibenstein's X-efficiency idea (1966). Following strong criticisms by a number of authors, it still remains rather controversial (Frantz, 1988). In this chapter, however, the focus will be simply how the industy performs facing the increased competition.

Clearly, dedicated operators must have a much higher cost structure than cross-traders. Some of these costs can be reduced such as crew costs, port costs and tax burden. But as long as existing and potential cross-traders can lift cargo at a marginal cost, they can maintain their cost advantages in the competition with dedicated operators.

4.3.2 Impact of Competition on Trans-Tasman Freight Rates

Competition from entry for trans-Tasman freight would force dedicated operators to cut crew and other costs. If they failed to do so they would lose a large fraction of market share. While quality of service is an important consideration in a shipper's choice of vessel, the co-existence of dedicated operators and cross-traders will be reached by market forces.

The existence of cross-trader services at a discount over existing rates would be expected to force down existing rates. As Table 4.7 illustrates, there is a cross-trader freight rate of $A 1,340 per TEU compared to the average liner freight rate of $A 1,710 per TEU in 1992 (BTCE and MOT, 1992). It suggests that the introduction of a cross-trader could result in a 22 per cent reduction in liner freight rates.

Shippers of high value goods who are producing for markets based on a just-in-time inventory and sales system would be more likely to continue to use dedicated liner services. Reliability of supply and access to particular ports are more important to producers of these goods than are freight rates. They would continue to support dedicated liner services to ensure reliable and timely delivery of their products. In contrast, producers of low value raw materials and semi-processed materials would find attractive the cheaper freight rates offered by cross-traders. For producers of these goods, freight rate reductions would offer significant competitive advantages.

4.4 A Test of the Contestability Hypothesis

In this study, the normative and policy implications of the contestability theory's applications are developed on the assumption that the national public interest should be primarily identified with that of the shippers. In this respect, contestability theory

provides the basis for the hypothesis that shipping companies cannot exercise market power, even when there is little head-to-head competition amongst incumbent firms in liner shipping market. Essentially, firms must be able to engage in "hit-and-run" entry into markets without incurring losses due to sunk costs (Bailey *et al.*, 1985, p. 153). On the other hand, for a market to be perfectly contestable, three conditions must be achieved: 1) all factors of production are mobile among markets, that is, sunk costs must be absent; 2) buyers are willing and able to switch quickly among suppliers, that is, entrant and incumbent firms must be systematically placed and have the same access to demand; and 3) incumbent firms are unable to change their prices quickly in response to the entry of a new firm.

Notwithstanding the fact that it is unlikely for all these extreme conditions to exist in any industry, contestability theory provides an alternative view of the competitive process. It may have important implications in industries such as the shipping and airline industries where factors of production are highly mobile among markets. To some extent the liner shipping industry approximates the conditions for contestability, but certainly, it does not conform to the conditions in every respect.

4.4.1 The Symmetrical Positions of Entrant and Incumbent

Concerning entry and exit, the Baumol Group (1982) points out that this is the most obvious indicator of contestability. However, an absence of entry does not in itself imply that a market is not highly contestable for it may be the result of competitive, entry forestalling pricing (Baumol *et al.*, 1982, p. 14). This means that a history of frequent entry and exit is a sufficient but not a necessary demonstration of contestability. Trans-Tasman liner shipping has recently experienced a very high turnover of lines (see Table 4.5 and 4.6). Its quantitative impact of entry, that is, capacity, has been very substantial (see Table 4.3). Such large scale entries in addition to the "hit and run" type entry are often considered characteristic of contestable markets.

Furthermore, a perfectly contestable market requires that all firms, entrant or incumbent, have equal access to the technology of production and customers, and are subject to the same regulations or non-market constraints. There also should be an

appropriately sized pool of potential entrants in the market. In this respect, the liner shipping appears uniquely favoured. The reasons here mainly include the mobility of vessels and the existing situation of oversupply in routes.

Equal access to technology: This condition appears to be satisfied in the liner shipping industry as the market for new or used (second-hand) vessels is a world market to which all firms can equally make purchases. Moreover, given the current overcapacity in the global ship building industry, it is unrealistic to deny any particular prospective buyer.

Regulations and non-market constraints: The most important of these constraints relate to maritime promotion policies, nationally specific service obligations, the existence of national, state-owned lines, and trade union favouritism. Since the "maritime union accord" broke down in 1996, cross-traders have got the same access to market as the dedicated operators. However, on the Australian side, shippers and shipping firms have suffered the monopoly of the Union at Australia's inefficient ports.[14]

Equal access to customers: Contestability requires that all firms, incumbents or entrants, have equal access to customers so as to allow buyers the freedom to choose the least costly supplier capable of meeting their needs (Baumol *et al.*, 1982). The market perception condition was manifestly developed on the assumption that all firms produce a homogeneous output. In liner shipping, the container could be seen as a homogeneous product, TEU, due to its standard specification. However, it is also evident that outputs might not be exactly homogeneous as major differences exist in the quality of services provided by different participants, in particular, in terms of ship service frequencies. Given that shippers maximize their profits, it is hard to imagine how shippers would maintain an irrational preference for specific carriers.

[14] This point of view is confirmed by the recent debate between the Australian Maritime Union and the National Farmers Federation. "Officially, the Australian Government is not involved in the war now looming on the waterfront. But it has targeted the waterfront, shipping and the monopoly of the union at Australia's notoriously inefficient ports. Canberra has been influenced heavily by reforms and efficiency gains on the New Zealand waterfront" (NZ *Herald*, Jan. 30, 1998, p. A11).

4.4.2 The Absence of Sunk Costs Condition

As Baumol *et al.* (1982) indicate, it is the existence of sunk costs that principally determine the risks of any investment. Contestability theory shows that, if the capital employed is reusable, resaleable, rentable or mobile, sunk costs will be low. It also shows that, in a perfectly contestable market, there is no necessary correlation between fixed costs (or scale economies) and sunk costs. In the liner shipping there are three principle factors that influence the degree of sunk costs.

Capital requirements in liner shipping

In terms of the seaward side of its operations, there appears to be general consensus that sunk costs in liner shipping are not high (see for example, Zerby 1982, Davies 1984). Ships are amongst the most mobile of all capital equipment and therefore vessel costs are not specific to or sunk into any particular trade. Also, the well developed second-hand market provides a place available for shipowners to sell or purchase any equipment, making possible reuse.

Another feature of the shipping industry is that there is a well-developed charter market. This enables companies to hire vessels through brokers on either a time or a voyage basis. Chartering means that effective control over a vessel can be purchased on a short-term basis without acquiring ownership of the vessel on a long-term basis. The owner of a vessel that is regularly chartered out essentially specializes in bearing long-term risks concerning appreciation in the capital value of the vessel, and lays off to the charterers the short-term risks of finding a profitable use for it (Branch, 1975, pp. 50, 55). There is also a market in ship management services, which allows the charterer to hire the expertise necessary to operate the ship whilst it is under his or her control. The combination of the charter market and the management services market provides producers with the flexibility to integrate temporarily into shipping as and when conditions warrant it (Branch, 1975).

In the trans-Tasman liner trade, entry in the industry, in particular for the cross-traders, does not necessarily demand the prior purchase of equipment and this, in turn, makes

exit much easier. Generally, cross-traders continue to use their current vessels, containers, and other equipment due to overcapacity in the global liner shipping industry. Even if entry needs extra equipment, almost all these assets could be acquired through the rental market.

Terminal facilities and ports operation

There is considerable disagreement amongst economists as to the consequence of shore-based activities, such as terminal facilities and ports operations. Zerby (1982) indicates that wharf facilities may create an impediment to contestability for two reasons. First, in the provision of terminal facilities sunk costs are very significant as the equipment is mostly geographically fixed and has no alternative uses. Second, if the facilities are owned by a certain shipping line, or group of lines, it may be possible for them to deny access to other users.

Nevertheless, Bailey (1981) argues that, if the wharf facilities are owned by the government or port authority or if it is mandated that they are shared in a non-discriminatory manner, they will not constitute a source of monopoly power. In New Zealand, many of the principal terminal facilities are owned by port authorities, which are under the control of local governments; and in Australia, even though many wharf facilities are leased by conference lines, the port authorities are still in a position to prevent any overt abuse of the terminal operators' position by being able at any time to terminate the operators' lease, thereby guaranteeing equal access to facilities (NZ *Shipping Gazette*, 12/1996). In addition, it should be noted that substantial excess capacity currently exists in terminal facilities on both sides of the Tasman Sea. In this situation it is not reasonable to deny potential customers the use of ports.

Goodwill as a sunk cost

Davies (1986) argues that a cost which may be irrecoverable on exit is that associated with the nurturing of goodwill. Customer loyalty, business connections and cargo soliciting networks cannot be transplanted on a shipping firm's withdrawal. However, in the trans-Tasman liner shipping market, cross-traders do not suffer these risks since they operate other routes that provide some connections with customers in the trans-

Tasman trade. Cross-traders may not even need to develop new customers because these customers might currently have service contracts on other routes with them.

4.4.3 Price Sustainability Condition

In order to test the U.S. airline industry for contestability, Bailey *et al.* (1985) provide a method that focuses on the behavioural issue of whether freight setting practices are consistent with the contestability hypothesis. In this framework, if airline markets behave as though they were contestable, then freight rates are independent of the competitive structure of a market and depend only on variables that determine the costs of serving the market (Bailey *et al.*, 1985, p. 154).

Notwithstanding that the required data is not available to conduct such a statistical analysis, the existence of physical conditions in trans-Tasman liner shipping could be used to assess its contestability. As noted in Section 4.2.2, freight rates in liner shipping are somehow cost based. At present there is a two-tiered cost structure with high-cost established dedicated operators comprising one tier and the low-cost cross-traders comprising the other tier. Dedicated operators may be trying to retain a set of cost-based freight rates, which is sustainable when high-cost firms compete or threaten entry. But they cannot retain their freight rates when entry by low-cost cross-traders occurs. Hence, dedicated operators may not be earning monopoly profits on their routes, even though they usually do cut prices whenever a new entrant shipping line enters.

Furthermore, price sustainability requires that existing firms are unable to change prices instantly. It follows that the reaction of incumbents are relatively slow compared with the response of customers. Thus entrants are in a position to negotiate contracts with customers prior to entry. In liner shipping the only way an entrant can obtain cargo is by negotiation with a shipper or shipper's agent. The negotiation of contracts is normal commercial practice in industry. Such contracts may be either official explicit arrangements or less formal in nature. Davies (1986a) points out that the loyalty contracts may be act as a "double-edged" sword: "the possibility of their negotiation may facilitate contestability through minimizing the risks of entrants at the same time,

but create a new entry barrier through effectively locking up a part of the market from further competition" (p. 72). In trans-Tasman liner shipping, loyalty contracts could provide shippers more freedom to choose shipping services, either from dedicated operators or from cross-traders.

4.5 Concluding Comments

It appears that parts of trans-Tasman liner shipping exhibit characteristics of contestability. The necessary conditions identified by Baumol *et al.* (1982) of symmetrical treatment, an absence of sunk costs and price sustainability seem to have been closely approached. The behaviour of the industry in terms of entry and exit and price trends is also likewise supportive of this.

However, industry's financial performance is not clear, mainly due to the data blockaded by private shipping firms. In addition, because of the threat from low-cost entry, price sustainability in the long run market equilibrium appears unstable. More importantly, actual competition, rather than potential competition, has been found to have a substantial effect on market performance, in contrast to the predictions of contestability theory. It may imply that we could observe some strategic behaviours conducted by incumbents (dedicated operators) with the intent to survive in this market. This question will be asked and answered in the next chapter.

CHAPTER FIVE

A Study on Strategic Behaviour: Conjectural Variations

> *If you know the enemy and know yourself, you need not fear the result of a hundred battles. If you know yourself but not the enemy, for every victory gained you will also suffer a defeat. If you know neither the enemy nor yourself, you will succumb in every battle.*
> __ Sun Tzu, The Art of War (490 B.C.).

5.1 Introduction

This chapter attempts to analyze the kinds of strategic behaviour that would lead to the outcomes in the markets predicted by contestability theory.[15] Strategic behaviour has a key role in industrial organization theory. The theory of contestable markets emphasizes the strategic issues created by scale of economies (Baumol, Panzar and Willig, 1982). In this framework, contestability theory specifies conditions under which the threat of entry into markets is sufficiently powerful that firms will price competitively regardless of whether the market is structurally competitive or non-competitive.

The robustness of the contestability theory is, nevertheless, still in question. Shepherd (1988a) points out that, if there are small variations away from the perfect assumptions in market, "almost-contestable" conditions are likely to give monopolistic results (p. 118). Moreover, the evidence in Chapter Four demonstrates that much that has occurred in trans-Tasman liner shipping industry since deregulation cannot adequately be described using contestability models. The analysis of the strategic behaviour of firms can help us explain these deviations from contestability and the direction of development of trans-Tasman liner shipping since deregulation.

This chapter is organized as follows. Section Two employs a "conjectural variations" model to assess the conduct of firms, using a simulation approach. Section Three further

[15] It was Grossman (1986) who stated that it was important to conduct an analysis on strategic behaviour which led to the outcomes predicted by contestability theory.

introduces a number of further developments in the deregulated trans-Tasman liner shipping market which seem inconsistent with perfect contestability, for instance, a wave of mergers and consolidations, and the dominance of a hub system. A summary appears in the last section.

5.2 Conjectural Variations Model

This section attempts to assess the competitiveness of a set of duopoly shipping routes so as to shed light on whether high levels of route-specific concentration should be viewed as a cause for concern. The second objective in this section is to add to the empirical evidence on the relative descriptive usefulness of certain simple oligopoly models, namely the Cournot model, the Bertrand model, and the cartel model. The methodology used in this section is to formulate and estimate a "conjectural variation" model of industry structure. It is worth noting, however, that the markets analyzed are more simplistic than the trans-Tasman liner shipping markets we have examined in the previous chapters.

5.2.1 Introduction

This analysis is focused on duopoly, so a duopoly version of the conjectural variations model is discussed, although the analysis and conceptual issues extend immediately to the n-firm case (see Appendix A). Furthermore, this analysis makes the two firms conjecture about each other's output responses endogenous by imposing a "consistency" condition, which follows the study of Bresnehan (1981) and Dixon (1988). In this framework, attention is restricted to a simple conjectural variations model where reaction functions are linear: consistency here means that firms know the slope of each other's reaction functions. Thus actual and conjectural responses are consistent. The consistency condition requires that "at the equilibrium vector of outputs, the conjectural response equals the slope of the reaction function" (Dixon, 1988, p. 149).

Suppose that two firms, referred to as firm 1 and 2, produce homogeneous outputs x_1 and x_2 respectively. Total output, denoted X, is the sum of x_1 and x_2, and inverse

demand is represented by $p(X)$. Costs for firm i, $i = 1, 2$ are denoted C^i, and profits, Π^i, can be written as

$$\Pi^i = x_i\, p(X) - C^i(x_i) \tag{1}$$

If treating output as the choice variable, and if restricting attention to a single period, that is, to a single choice of x_1 and x_2, then the Nash equilibrium is represented by first-order conditions [16]

$$\Pi^i_i = p + x_i\, p' - c^i = 0 \tag{2}$$

where subscripts on Π represent derivatives and c^i represents marginal cost. This Nash quantity (or "Cournot") solution might fail to hold for a variety of reasons. For example, if price rather than quantity is the choice variable, then the Nash equilibrium (in prices) will not satisfy (2), or if the firms manage to collude and maximize combined profits, then (2) will not be satisfied. Hence, it can further be written as

$$p + x_i\, p' - c^i = \lambda^i\,(x_1, x_2) \tag{3}$$

As equation (3) is simply definitional, it contains no theoretical restrictions. The variable λ^i is simply defined as the difference between the left-hand side of (2) and zero. In general we can expect λ^i to vary with x_1 and x_2, and possibly with other variables or parameters as well.

The conjectural variation model arises by assuming that each firm views industry output X as a function of its own output x_i, thus yielding the first-order condition

$$\Pi^i_i = p + x_i\, p'\, dX/dx_i - c^i = 0 \tag{4}$$

which, after noting that $dX/dx_i = dx_i/dx_i + dx_j/dx_i = 1 + dx_j/dx_i$, can be rewritten as

$$\Pi^i_i = p + x_i\, p'\,(1 + v_i) - c^i = 0 \tag{5}$$

where $v_i = dx_j/dx_i$. Variable v_i is referred to as the "conjectural variation". Conjectural variation, as an equilibrium concept, is a way to quantify the intensity of competition between oligopolists. In a subgame perfect equilibrium, "no firm wants to deviate by himself, and his beliefs about how the other firms would behave would be confirmed

[16] The conjectural variations model indicates that one firm chooses an output because it expects the other firm to respond in some particular way (Varian, 1992, p. 303). Hence, it assumes that the other firm responds in a one-shot game.

whatever nodes were reached" (Dixon, 1988, p. 155). Under conjectural variation, a firm believes that, if he deviates, the other firms would deviate in specified ways.

Firm i's conjectural variation is the rate dx_j/dx_i at which he conjectures that the output of other firms would change if i's own output changed. We can put the following special interpretation on certain conjectural variation values (see Varian, 1992, pp. 302-303).

- $v_i = 0$ In a Cournot-Nash equilibrium, firm i believes that if he deviated by producing more, other firms would not deviate, so the conjectural variation equals 0.

- $v_i = -1$ If firm i believes that an increase in his output is matched by a decrease in other firms' output, so the total industry output is left unchanged, the conjectural variation is -1. If all firms use this conjectural variation, the industry output is the competitive level, thus firms ignore the effect of their output in depressing the price. Specifically, if the two firms have the same costs and can be described by the Bertrand model, then both should have conduct parameters -1.

- $v_i = 1$ If firm i believes that other firms would exactly match his output changes, the conjectural variation is 1. With two firms, industry output is at the monopoly level. Similarly, for a n-player game $v_i = n-1$ achieves the monopoly level.

- $0 < v_i < 1$ In Stackelberg equilibrium, the conjectural variation of the Stachelberg follower is between 0 and 1, and takes the value given by a reaction function (that is, slope of firm 2's reaction curve).

- $v_1 = x_2 / x_1$ Specifically, in a duopoly model, the first-order condition could reflect the condition for maximizing industry profits. In this case, there is the collusive equilibrium.

Brander and Spencer (1985) and Dixit (1988) state that the conjectural variation is simply a useful and intuitive summary measure of market conduct. It shows from a comparison of equations (3) and (5). As mentioned above, equation (3) is a fully general description of behaviour. By rearranging equation (3) and (5), we get $v_i = -\lambda^i (x_1, x_2)/p'x_i$ thus the expression of equation (5) is equivalent to that of equation (3).[17]

The estimated measure of v^i can then be used to address the question of whether the industry is consistent with the Bertrand model or with the Cournot model or with the cartel model. Hence, the conjectural variation can be regarded as an indicator of the strategy variable, or as an indicator of the degree of competition, thereby simply as a "conduct parameter" (Brander *et al.*, 1990, p. 569).

5.2.2 Data and Market Conduct

The principal objective here is to estimate conduct parameters (conjectural variations), thereby examining whether the results support Bertrand, Cournot, or cartel outcomes. Suppose that there is a set of duopoly shipping firms. By rewriting first-order condition, equation (5) (see Appendix B), we get

$$v_i = (p - c^i) \eta(X) / (ps^i) - 1 \qquad (6)$$

where $\eta(X)$ is the positive elasticity of market demand, $-(dX/dp)(p/X)$, and s^i is the market share of firm i. Since equation (6) is a deterministic one, conduct parameter v_i can be calculated by the elasticity of demand at the observed point, the market share of firm i, and marginal cost at the observed point (Brander *et al.*, 1990).

In this respect, the data required for analysis are as follows:

1. price information for each shipping line (firm) and route;
2. marginal cost per container for each shipping line (firm) and route;

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[17] Rearranging equation (5), we get

$$\prod_i^i = p + x_i p' (1 + v_i) - c^i = p + x_i p' - c^i + x_i p' v_i = 0 \qquad (5')$$

Substitute equation (3) into equation (5'), then

$$\prod_i^i = -\lambda^i (x_1, x_2) + x_i p' v_i = 0 \qquad (5'')$$

Thus, we get $v_i = -\lambda^i (x_1, x_2)/p'x_i$ by rearranging equation (5'').

3. elasticity of demand for each shipping line (firm) and route;
4. market shares for each shipping line (firm) and route.

First of all, equation (6) calls for the elasticity of demand. As mentioned in Chapter Four, this study makes the approximation that the general twenty feet container (TEU) category can be treated as a homogeneous product. Hence, it is possible to obtain a demand elasticity from the data set by assuming a common demand structure across routes, imposing a particular functional form, then estimating a demand elasticity.

However, because there are only a few observations, it is unlikely to obtain reasonable estimates of a sufficiently flexible demand structure in this study. One preferred approach is to take elasticity estimates from the most carefully done study we could find and use them in equation (6).[18] Accordingly, this study has taken elasticity estimates from Oum *et al.* (1986). They used the translog function as the parametric specification of demand. This allows elasticities of demand to vary according to output level. Their estimated elasticities for transportation routes range from 1.2 to 1.4 (Oum *et al.*, 1986, p. 196).

Furthermore, equation (6) calls for route-specific marginal cost data. Unfortunately, the appropriate operational definition of marginal cost is far from obvious, mainly due to the primary data blockaded by firms in the industry. Table 5.1 gives an analysis of the estimated costs for container-ships operating between two ports in Australia (Sydney and Melbourne) and four ports in New Zealand (Auckland, Tauranga, Wellington and Lyttelton).

The figures in Table 5.1 are based on those estimated by the BTCE and MOT (1992) using a ship costing model. In addition, the data used for modelling these costs were obtained from the 1992 survey (BTCE and MOT, 1992). Meanwhile, some costs, such as stevedoring costs in New Zealand, are modified using more up-to-date data.

[18] A similar approach was employed by Brander *et al.* (1990).

Table 5.1

Analysis of Container-ship Costs for A Hypothetical Trans-Tasman Service [a]

Cost Item	200 TEU	400 TEU	600 TEU	800 TEU
Blue water costs ($A per TEU)				
Ship capital	147	115	104	100
Crew	370	206	144	113
Fuel	148	109	97	90
Port authority ship	80	82	91	98
Other blue water	237	166	140	129
Total blue water	1 005	678	576	530
Cargo costs ($A per TEU)				
Stevedoring				
Australia	376	367	363	362
New Zealand	167	167	167	167
Wharfage ($A per TEU)				
Australia	47	47	47	47
New Zealand	32	32	32	32
Agents	150	150	150	150
Container administration	146	138	135	133
Container capital	75	75	75	75
Other cargo costs	18	18	18	18
Total cargo costs	1 012	991	986	982
Total ($A per TEU)	2 018	1 670	1 562	1 513
Voyage time (days)	19	20	21	22
Utilisation (per cent)	75	75	75	75

Note: [a] The cost estimates shown here are for services calling at two ports in Australia (Sydney and Melbourne) and four in New Zealand (Auckland, Lyttelton, Tauranga and Wellington).

Calculated from BTCE and MOT estimates (1992), Price Schedules of Port Wellington and Ports of Auckland, and NZ *Shipping Gazette* (various issues).

As Table 5.1 illustrates, the specification of route-specific total cost is not linear in distance.[19] A lot of crew time is used in boarding and departing, and ports costs occupy

[19] It should be noted that in practice shipping companies report overall costs, not route-specific costs.

a significant part of total cost. This suggests that costs are strictly concave in distance rather than linear. Also, information from the interviews with people working in the shipping industry indicates that the current freight rate in trans-Tasman liner shipping industry is a "Pan-New Zealand" rate. It means that the cargoes in the same commodity category are carried with the same freight rates by shipping firms regardless of their geographical destination. The NZ *Shipping Gazette* (30/1997) points out that the current intensive competition in the trans-Tasman shipping industry brings about a need to scrutinise on the "Pan-New Zealand" freight rate.

Moreover, Table 5.1 shows the lower unit costs attainable by larger ships due to economies of size, particularly for crew, fuel and capital costs. Comparing figures for the 800-TEU and 200-TEU vessels shows that unit blue water costs are 47 per cent lower ($A 530 instead of $A 1,005 per TEU). Assuming the same utilization rate, it shows that increasing ship size cuts unit cargo costs (see Table 5.1). However, it also appears that the larger the ship size is, the longer the voyage time and the lower the service frequency.

5.2.3 Simulation Analysis

Baumol *et al.* (1986a) argue that to understand the full scale of contestability, it is useful to use a simulation technique. In this study, simulation is used in the estimation of conduct parameters. We postulate a set of duopoly in the trans-Tasman trade with respect to the relevant information about pricing, costs, and market shares. The results should be able to indicate the effects of changes in prices, costs, and market shares, taking into account firms' strategic behaviour.

In this study, we assume there is a set of duopoly in the trans-Tasman trade, in which firm A has a larger capacity than firm B (see Table 5.2). Also we choose 1992 and 1996 as specific years to examine, because the "Tasman Maritime Accord" was valid in 1992 but abolished in 1996. Consequently, we define that there is competition only among dedicated operators in 1992, while competition in the 1996 market is mainly observed between dedicated operators and cross-traders. The common sense suggests

that the market conduct (conjectural variations) in 1992 and 1996 should be different due to these two different kinds of competition.

As Brander *et al.* (1990) indicate, "if two firms in a duopoly have slightly different cost, then, strictly speaking, the less costly firm will have a Bertrand conduct parameter that is slightly larger (*i.e.*, less negative) than -1, while both firms may have cartel conduct parameters that differ slightly from 1" (p. 575). We suppose that the costs here are sufficiently close.[20] Thus, we could continue to treat the values -1 and 1 as representing the Bertrand and cartel solutions. In addition, the Cournot conduct parameter is 0, even if costs differ.

According to Table 5.1, we choose cost level at $A 1,550 per TEU for both dedicated operator A and B in 1992.[21] Additionally, we choose price level at $A 2,200 per TEU in 1992. This estimation is based on the 1992 survey conducted by the BTCE and MOT. Due to the ongoing reforms in trans-Tasman liner shipping, the price level in 1996 has been reported to fall 40 per cent compared with the 1992 level (Longley, 1997). Hence, the price level in 1996 is estimated at about $A 1,500 per TEU. In addition, Swan Consultants (Canberra) (1994) indicates that all dedicated operators have reduced their expenses in crew costs and port costs. These savings have come mostly from the waterfront reforms since 1990. Hence, there is another option to test dedicated operators with a lower cost of $A 1,400 per TEU (about 10 per cent less than that of 1992).

In their 1992 analysis of trans-Tasman shipping, the BTCE and MOT estimated costs faced by cross-traders. Marginal costs for general cargo vary significantly depending on the service offered (see Table 4.7). Here we assume an average cost level for cross-

[20] In the homogeneous product case, the Bertrand model requires that price equals marginal cost (Varian, 1992). If $v = -1$, from equation (5), it arises the Bertrand conducts.

[21] It should be noted that there is continuing presence of relatively small vessels in the trans-Tasman trade. For instance, in 1996 TEL replaced its trans-Tasman fleet with two new container vessels, each only 370 TEU capacity. In addition, SPS even operates some smaller vessels. The largest specialized container vessel currently operated is the 1034 TEU, *Tranztas Trader*, which is operated by BHP (details see Appendix C).

traders at $A 1,100 per TEU.[22] Also we assume that cross-traders would introduce marginal cost as the criterion for pricing. Hence, the price level for cross-traders is estimated at $A 1,200 per TEU. The NZ *Shipping Gazette* (8/1997) also indicates that the current price level in the Auckland market has dropped to around $A 1,200 per TEU, which confirms this estimation.

Market shares for each shipping company are estimated using the data published in the NZ *Shipping Gazette* (5/1997). In addition, although the Commerce Commission was unable to disclose the actual figures for reasons of business confidentiality, the documents provided by the Commerce Commission present a good reference for this study.[23] By using this, we assume that in 1992 market share for dedicated operator A is 60 per cent, while market share for operator B is 40 per cent (see Table 5.2). This is based on the assumption that the large vessels could provide relatively large capacity and therefore have a large market share. Similarly, we estimate that in 1996 dedicated operator A's market share is 80 per cent. And we, in turn, suppose that cross-trader B's market share is 20 per cent. The estimations here are based on the information provided by the Commerce Commission (1997) and Longley's paper (1997).

Table 5.2 Data and Conduct Parameters

	1992		1996	
	Dedicated Operator A	Dedicated Operator B	Dedicated Operator A	Cross-trder B
Elasticity (η)	$\eta = 1.2$	$\eta = 1.2$	$\eta = 1.2$	$\eta = 1.2$
Price ($A/TEU)	2200	2200	1500	1200
Cost ($A/TEU)	1550	1550	1400	1100
Market Share (S^i)	60%	40%	80%	20%
V_i	-0.16	0.26	-0.89	-0.45

[22] As mentioned earlier, this analysis is based on the assumption that the costs are sufficiently close. In this sense, the analysis for the 1996 case may not apply. However, it should be noted that the results will be still valid to examine whether the Cournot conduct applies.

[23] Under the *Official Information Act 1982*, some copies of staff reports relating to the merger of shipping firms are provided by the Commerce Commission. Certain commercially sensitive information has been withheld in terms of ss 9(2)(b) and 9(2)(ba) of the Act.

Following Oum *et al.* (1986), we use 1.4 as a "base case" elasticity. Table 5.2 illustrates the results of using the "conjectural variations" model in the base case. The estimated conduct parameters are in the "reasonable range" of -1 to 1. As Brander *et al.* (1990) argue, "from a pure computational point of view, such estimates can easily be large negative or positive numbers" (p. 577). In this sense, the reasonableness of the calculated conduct parameters brings about more confidence in the methods used.

Contrary to our expectations, the conduct parameters in 1992 and 1996 are not significantly different. But Table 5.2 shows that the firms appear to be more competitive in 1996 (*i.e.,* have lower conduct parameters) than these in 1992. In addition, applications of hypothesis tests would strongly reject the cartel hypothesis (v_i = 1). In the 1992 case, the estimated conduct parameters approach the Cournot value, remaining within range of the value of 0. It should be noted that we assume the same marginal cost and price for both dedicated operators. However, in practice, operator B (with less capacity) may have a relatively high marginal cost (see Table 5.1). In this respect, a price-cost margin (PCM) is over-estimated for dedicated operator B. Hence, the conduct parameter of operator B would be less and much closer to 0. It is further implied by equation (6) that the conduct parameter is increasing in price-cost margin (PCM), demand elasticity, and decreasing in market shares and marginal costs.

Brander *et al.* (1990) indicate that, "ideally, one would want to have some idea of the errors associated with the estimates of the demand elasticity and the cost parameters, and to incorporate them in the calculation of standard errors and confidence intervals for the base case" (p. 577). Similarly, this study employs a practical alternative to check on the fragility or robustness of the basic conclusions. A sensitivity analysis is conducted over the range of reasonable parameters (see Table 5.3). For instance, our base case value of the elasticity of demand and the price-cost margin (PCM) are not significantly sufficient.[24] Hence, a sensitivity analysis is employed to examine how

[24] Since prices and costs are generally difficult to observe and compare, many studies make use of the price-cost margin (PCM). Pickford *et al.* (1995) employ a concept of the gross return on sales to measure (TR-TC)/TR = (P-AVC)/P, serving as a proxy for the Lerner index of market power, that is, PCM_{ij} = (Sales $revenue_{ij}$ - Labour $costs_{ij}$)/Sales $revenue_{ij}$ (ibid, pp. 7, 8).

sensitive these results are to various modifications in the underlying demand and cost parameter assumptions embodied in the estimations of conduct parameters.

Table 5.3 **Sensitivity of Conduct Parameters**

Part A: The 1992 Case

	Dedicated Operator A (V_i) Price-Cost Margin (PCM)		Dedicated Operator B (V_i) Price-Cost Margin (PCM)	
Elasticity	**0.20**	**0.40**	**0.20**	**0.40**
$\eta = 0.8$	-0.73	-0.47	-0.60	-0.20
$\eta = 1.2$	-0.60	-0.20	-0.40	0.20
$\eta = 1.6$	-0.47	0.07	-0.20	0.60

Part B: The 1996 Case

	Dedicated Operator A (V_i) Price-Cost Margin (PCM)		Cross-trader B (V_i) Price-Cost Margin (PCM)	
Elasticity	**0.20**	**0.40**	**0.20**	**0.40**
$\eta = 0.8$	-0.80	-0.60	-0.20	0.60
$\eta = 1.2$	-0.70	-0.40	0.20	1.40
$\eta = 1.6$	-0.60	-0.20	0.60	2.20

Following Oum *et al.* (1986) and Pickford *et al.* (1995),[25] we choose the values of η considered at 0.8 and 1.6, and the values of price-cost margin (PCM) at 0.20 and 0.40. There are therefore three sets of results for each of the two PCM levels. Most of the values remain generally within range of [1, -1]. Once again, firms appear to be more competitive in 1996 (*i.e.*, have lower conduct parameters) than those in 1992. We found that, more importantly, if the demand elasticity is lower, then a given price-cost margin would be explained by more competitive (*i.e.*, lower) conduct parameters; and if the demand elasticity is higher, then there are lower competitive conduct parameters. There are at least two further problems to consider in this simulation analysis: 1) our

[25] Using disaggregated data, Pickford *et al.* (1995) measure the PCMs of firms in manufacturing industry in New Zealand (Table 1). Overall, gross returns on sales average 80.5 per cent for all groups (ibid, p. 8). To consider characteristics of shipping industry and the impacts of deregulation, the PCMs we used in this study are much smaller.

assumption of duopoly firms, which are less competitive than the overall market average; and 2) the implied profit rate is quite sensitive to various parameter estimates. However, with respect to the measurement of both price and marginal cost, the results seem consistent with a plausible interpretation of profit comparisons in trans-Tasman liner shipping industry.

Furthermore, there have been extensive consideration of the appropriate interpretation of the conjectural variation model (Bresnahan, 1981; Perry, 1982; Friedman, 1983). They argued that the conjectural variation, as it arises in a static or "one-shot" model, cannot be taken as a literal expectation of future strategic reactions. At best it is some sort of static approximation to the real-time action and reaction that arises in a dynamic setting (Brander, 1990, p. 569). To understand the performance of the liner shipping industry, it is necessary to explicitly consider the repeated game aspect of firm interaction. Hence, it would be interesting to look at the time series behaviour of the conduct parameter and to draw inferences about dynamic interaction in duopoly. Many empirical studies suggest that transport industries sometimes engage in "cut-throat" competition, perhaps resembling the Bertrand outcome, sometimes succeed in establishing very high price cost margins, and sometimes engage in "normal" competition (see for example, Brander *et al.* 1990; Davies 1990).

5.3 Evidence from Deregulated Trans-Tasman Liner Shipping

There are a number of developments in the deregulated trans-Tasman liner shipping markets that seem inconsistent with the predictions suggested by contestability theory. These surprising outcomes are identified as: 1) a wave of mergers and consolidations; and 2) the dominance of a hub system.

5.3.1 Horizontal Mergers and Consolidations

The advent of new competition in trans-Tasman liner shipping industry stimulated a series of major mergers and consolidations of two main kinds: 1) among directly competing major dedicated operators (see for example, SPS and TEL); and 2) between major dedicated operators and cross-traders (see for example, Union Shipping and

ANZDL). Both kinds of mergers and consolidations raise dominant-firm shares in major routes. In the meantime, there are significant changes in the cost structure of dedicated operators through mergers and consolidations.

At first trans-Tasman deregulation led to intense competition, rapid entry by many cross-traders, and vigorous price competition. Freight rate discounting became widespread and turbulent. The new pressures of competition upon profits forced shipping firms, in particular dedicated operators, to find a way to survive in the trans-Tasman trade.[26] Martin (1996) indicates that in the shipping industry, if the competition is intense, it can be transformed into cooperative competition by mergers, buyouts, and cartelisation. It is widely believed that "mergers serve as an efficient, humane escape route for companies that otherwise are about to fail" (Scherer *et al.*, 1990, p. 162). The proponents of the merger argued that there are significant increases in the operational economies of scale. These economies would relate to container management, inland operations and computer systems.

Moreover, mergers and agreements tied dedicated operators and cross-traders together. By doing so, dedicated operators could rearrange their routes and reduce operation costs; and cross-traders could enter the market without retaliation by the unions. For instance, the Australian Maritime Union agreed to allow BHP's nine cross-trader vessels to carry trans-Tasman cargo in exchange for BHP taking over a dedicated vessel. As a consequence, there are only three groups of dedicated operators currently providing services in trans-Tasman liner shipping markets.

Meanwhile, slot-sharing has been a central element in most of the alliances. The agreements vary considerably and the details of the contracts are not available to the public. The advantage of slot-sharing to the dedicated operator is that a connection between a feeder market (such as the trans-Tasman trade) and a global market is treated in the computer operation system as an online connection (NZ *Shipping*

[26] The recent examples include the withdrawal of ANL in 1996, and the reduced trans-Tasman services provided by SPS.

Gazette, 6/1997). This information precedence would seem to offer a substantial competitive advantage in competition.

It has always been important to conduct research on merger or consolidation in the industry, which remains extremely controversial. For instance, there are economic models to compare the deadweight loss attributable to an increase in market power brought about by a merger with the concomitant efficiency gains (Martin, 1996).[27] In a Canadian case, Martin (1996) argues that the merger of container carriers seems contrary to Canadian public interest. He indicates also that the probability of an increase in freight rates after the merger really depends on the intensity of competition, which in turn remains a market matter.

On the other hand, Demsetz (1973, 1974) argues that some industries become concentrated because of the superior efficiency of large firms. This efficiency view provides some important policy implications. For example, if large firms are efficient, competition policy that intends to reduce market concentration will cause harm to the market. Furthermore, focusing on the New Zealand case, Pickford *et al.* (1995) propose that:[28]

> *The combination of a relatively small economy and economies of scale seem likely to generate concentrated markets and significant cost advantages to large firms, so that the efficiency-market power trade-off could be especially pronounced. In apparent recognition of this possibility, the Commerce Act 1986, while proclaiming its objective to be one of promoting competition, allows that stance to be overridden in the case of restrictive practices and mergers which generate a benefit to the public, outweighing the detriment from loss of competition* (Pickford *et al.*, 1995, p. 3).

[27] Notably, this is expressed by the "naive" tradeoff model of Williamson (1968).
[28] For detailed studies, see Pickford (1983 and 1993).

Since the trans-Tasman liner shipping industry is still in transition, there is no data available to conduct a quantitative analysis on the impacts of merger in the market. An attempt to do so is also beyond the scope of the present study. However, as the simulation analysis shows, the firms in 1996 appear to be more competitive than those in 1992. Meanwhile, as the NZ *Shipping Gazette* (3/1998) indicates, intense competition between dedicated operators and international cross-traders has depressed freight rates to record low levels in the trans-Tasman liner trade. As a result, the new line (UDL) formed by the merger of Union Shipping and ANZDL has lost several million dollars on their new trans-Tasman operation (ibid, p. 1). This fact may support the Commerce Commission's decision on the merger and alliance case, which will lead to effective competition in the trans-Tasman trade (Commerce Commission, 1997).

5.3.2 Hub and Spoke Systems

Another striking feature of the deregulated trans-Tasman liner shipping market has been the emergence of the "hub and spoke" system as the route structure of choice for deregulated shipping lines. The emergence of a hub system has reassured shipping lines concerned about survival. In trans-Tasman liner shipping market, Auckland has most likely acted as a hub, whose container operation doubled in the last four years (NZ *Shipping Gazette*, 12/1997). On the other hand, as a result of the coastal shipping reform in 1995, shipping lines reduced their use of minor ports such as Bluff, Timaru, Nelson, Port of Chalmers, New Plymouth, and Napier.

Hub systems have the useful characteristic of creating market power. Most cross-traders only provide services from Auckland to Australian ports and from Australian ports to Auckland. As a consequence, the price on the Auckland route has dropped nearly 50 per cent in the last four years. Also, competitive coastal shipping and inter-modal competition increase the possibility that customers choose a hub port with a relatively low price rather than a minor port with a high price.

In addition, with hubbing and the concentration of international cargoes in a few ports, there is an increasing demand for the replacement of the current "Pan-New Zealand" freight rate system. Given that there will be fewer direct services to secondary ports

(for instance, Napier, Timaru and Bluff), there are, conversely, more feeder services to primary ports, in particular Auckland and Lyttelton. It also raises the issue of whether there should be greater pricing discrimination between primary and secondary ports. Shippers believe that the true cost elements within the distribution chain should be made more transparent (NZ *Shipping Gazette*, 28/1997).

On the other hand, competition between New Zealand ports is likely to intensify as well. One reason is that shipping firms have been reducing the number of ports their vessels call on directly, choosing instead to offer superior intermodal connections. Furthermore, the expansion of intermodal shipping options means shippers no longer automatically move their cargo through the nearest port. As Robinson (1997) indicates, "the existing ports/shipping network is being transformed into new networks that reflect an increasing segmentation of the market place and are hierarchical" (p. 18). The developments in the trans-Tasman shipping industry are bringing about a range of new trends, for instance, manufacturing investments, which are likely to effectively restructure existing patterns.

5.4 Summary

In this chapter, a duopoly version of the "conjectural variations" model is used to examine the strategic behaviours of shipping firms before and after deregulation. The simulation analysis demonstrates that the competition level of firms has been improved post-deregulation. However, the results show that there is no Bertrand behaviour observed as the theory of a perfectly contestable market predicts. Meanwhile, the development of the hub system, and activities of mergers and consolidations have been found in the trans-Tasman liner market. Hence, it is still too soon to say that there will be no further structural changes in this industry. A sensible response to the deregulated liner shipping would be to accept it, in principle, while recognizing that those improvements have been made at the expense of a new set of problems.

CHAPTER SIX

Summary and Conclusions

> *Empirical study may be useful in converting the* ***qualitative*** *distinctions drawn in theoretical predictions into* ***quantitative*** *distinctions.*
> __ Joe S. Bain, "Barriers to New Competition", 1956, p. 183.

6.1 Introduction

This study examined empirically the presence of competition and contestability in trans-Tasman liner shipping industry. In particular, the main objective is to analyze the impacts of deregulation on the trans-Tasman liner trade. Clearly, the recent conditions in the trans-Tasman liner trade are both ***qualitatively*** and ***quantitatively*** different from those prevailing in the 1980s and the early 1990s. Taken at face value, the trade appears more competitive. Meanwhile, new entry has been associated with an increase in the number of voyages and capacity, and at the same time, a fall in vessel utilization. On the other hand, real freight rates have fallen. While the level of real costs has also fallen, the decline has not matched that of freight rates, with the result that the profitability of the trans-Tasman liner trade has declined. In order to recoup, shipping firms have attempted to rationalize the trade through merger or consolidation. The following sections discuss the major findings of this study and suggest some areas for further research.

6.2 Summary

Chapter One introduced briefly the main concepts of contestability, such as "hit-and-run" entry, the absence of sunk cost, and threat of entrants. The general concept of contestability asserts that in a perfectly contestable market, perfectly competitive performance is spontaneously achieved irrespective of the number of firms present and their scale of production or capital requirements.

The issue of contestability as one of many factors that influence the effectiveness of competition in a market was examined in Chapter Two. The review of literature has suggested that, despite various attempts undertaken by many economists, the applicability of contestability theory as a descriptive theory is found to be ambiguous and limited. Several reasons which obscure the concept of contestability were pointed out, including: inaccuracy of data used, unrealistic assumptions underlying the quantitative analysis, and rigid assumptions underlying estimated models. Instead, as a normative theory, contestability theory was shown to provide an extreme benchmark that could be a relevant analytical tool for transport studies.

In order to identify some of its characteristics and implications for competition and contestability, a descriptive analysis of trans-Tasman liner shipping was then provided in the following chapter. In particular, the dramatic changes in the current policy and regulatory frameworks in the trans-Tasman liner trade were analyzed. Moreover, it was shown that there is over-tonnaged capacity and intense competition in the current trans-Tasman liner trade.

Chapter Four addressed the characteristics of liner shipping in pricing and costs structure, before introducing contestability theory in the empirical analysis in this study. To examine the market's contestability, a normative analysis was conducted on the assumption that the national public interest should be primarily identified with that of the shippers. In this respect, the finding that the trans-Tasman liner trade is somewhat contestable indicated that shippers' interests are currently being served by the market post-deregulation. In contrast to the predictions of contestability theory, however, actual competition, rather than potential competition was found to have a substantial effect on market performance.

Chapter Five employed a traditional "conjectural variations" model to examine the strategic behaviours of shipping firms before and after deregulation. Due to the inaccessibility of data, a simulation approach was used in this study. It was found that the degree of competition within the industry has been intensive post-deregulation. The current developments of merger and consolidation, and a hub system, which normally

seems inconsistent with contestability, were also examined. Information on the trans-Tasman liner trade suggests that the existing ports/shipping network is being transformed into a new network that is more competitive and cost-efficient. This view further supports the Commerce Commission's decision on the applications by shipping firms with respect to merger and consolidation.

6.3 Conclusions

Using a normative analysis, this study finds that parts of the trans-Tasman liner trade exhibit characteristics of contestability, such as frequent entry/exit, an absence of sunk costs, and pricing behaviour. The evidence supports our contention that the trans-Tasman shipping deregulation encouraged a competitive market by eliminating regulatory restrictions and collusive activities.

However, with small deviations from the assumptions of a perfectly contestable market, namely a low-cost new entrant, this empirical study finds that potential competition does not have a moderating effect on freight rates, over and above that of actual competition. It further shows that under deregulation Australasian shipping firms (dedicated operators) may be forced to get out of the trans-Tasman trade due to the intensive competition and their costs disadvantages.

The reality of the deregulated trans-Tasman liner market is that it is inherently unstable and, to some extent, contestable. As a result, "price wars" are likely to erupt on occasions. These "price wars" are triggered by shifting market shares and are more likely to occur when demand is high. Routes with higher elasticity customers and low capacity utilization, such as services to and from Auckland, are prime targets for aggressive business behaviour. There will be varying degrees of service levels across New Zealand ports.

When deregulation first allowed low-cost cross-traders, there seemed to be only two alternatives available to dedicated operators. First was to engage in a "price war", matching or undercutting the new entrant's freight rates for all capacity on the routes.

Second was to rely on its market share and allow the new entrant to operate until its market share became unacceptable. However, we find that both strategies were unattractive to dedicated operators. In contrast, the answer comes from the economies of scope and of scale in trans-Tasman liner shipping industry. Through introducing cross-trader services, dedicated operators will be able to optimize their costs structure, increase frequency, and provide more value-added services. Since post-deregulation, a period of intensive competition and restructuring in the liner shipping industry has occurred.

The study raises a new question as to whether deregulation has been good public policy and whether re-regulation of some kind would be desirable. We conclude that perfectly contestable markets can not be seen as the ultimate goal. Instead, they are instruments expected to produce public benefits. For national regulatory policy, these public benefits, not the economic instruments, are the ultimate objectives. Deregulation has not brought about all that was previously predicted because deregulated markets only approximate the results of perfect competition or perfect contestability.

Indeed, the world of deregulated liner shipping is much more complex than imagined by deregulation's original proponents and opponents. Clearly, deregulation has brought very substantial benefits to the shippers, to a national economy which now more than ever needs efficient industries and to those members of the labour force who will work for competitive wages. Baumol *et al.* (1982) provide an excellent argument, which is used as the philosophy of competition to conclude this study: "in the presence of *unsustainability* ("price wars"), it may be that the only way the incumbent can maintain stability for itself - and in the process provide for society the most *cost efficient* industrial structure - is to engage in responsive pricing and other strategic behaviour designed to kill off actual or to deter potential competition" (ibid, pp. 356, 361; emphasis added).

In terms of policy implications, our evidence supports the decisions made by the Commerce Commission (1997) and the proposal of government shipping reform workforce (1992), which view New Zealand as a user of shipping not a provider. The

current intent to lobby government for protection and intervention in the trans-Tasman liner trade is shown to be anti-competitive. Moreover, in terms of theoretical implications, this study suggests that the theory of a perfectly contestable market may not be robust with small deviations from its assumptions. Instead, contestability theory supplements industrial organization theory with a new device specializing in performance implications of competition. This comes back to our conclusion that in the deregulated trans-Tasman liner shipping industry, the firms left standing will be those that are internationally competitive.

6.4 Further Research

Due to the limitation of data, the positive and normative analysis of the shipping industry has proved both difficult and controversial (see for example, Davies, 1984a; Zerby, 1982 and 1988). A number of factors that greatly complicate the study of the liner shipping industry remain to be examined. These include: 1) the difficulties of establishing "fair" price/cost relationships (PCM) given insurance externalities, and the influence of exogenous factors on sustainable load factors; 2) the significant weight of common costs in liner shipping operations; 3) the backhaul and cross-traders problem; and 4) the recurring problem of identifying necessary and sufficient conditions for workable competition in liner shipping. Moreover, it would be useful to examine a *N*-firm version of "Conjectural Variations" model in the liner shipping industry, using empirical data. And from a geographical perspective, it may be important to estimate how the waterfront deregulation is related to the restructuring of the whole ports/shipping network.

Appendix A

A "Conjectural Variations" Model: *N*-Firm Case

Suppose that n firms, referred to as firm 1, 2, ... n, produce homogeneous outputs x_1, x_2, ... x_n respectively. Total output, denoted X, is the sum of x_1, x_2, ... x_n, and inverse demand is represented by $p(X)$. Costs for firm i, i = 1, 2, ... n are denoted C_i, and profits, Π_i. We get

$$\text{Max} \quad \Pi_1 = x_1\, p(x_1 + v_2\,(x_1, .. x_j .., x_n) + ... + v_n\,(x_1, ..., x_{n-1})) - C_1(x_1) \tag{1}$$

where x_j is not firm 2. If regarding output, as the choice variable, and if restricting attention to a single period, that is, to a single choice of x_1, x_2 ... x_n, then the Nash equilibrium is represented by first-order conditions

$$\frac{\partial \Pi_1}{\partial x_1} = P(X) + \frac{\partial P(X)}{\partial x_1}(1 + \frac{\partial v_2}{\partial x_1} + ... + \frac{\partial v_n}{\partial x_1})x_1 - C_1^{'}(x_1) = 0 \tag{2}$$

where subscripts on Π_i represent derivatives and C^i represents marginal cost. If we assume a symmetric problem, it can further be written as

$$\frac{\partial \Pi_1}{\partial x_1} = P(X) + \frac{\partial P(X)}{\partial x_1}(1 + (n-1)\frac{\partial v_k}{\partial x_1})x_1 - C_1^{'}(x_1) = 0 \tag{3}$$

where k is not 1. As most microeconomic models are structured in such a way that responses to changes are inevitably symmetric (Dixit, 1988), it is important to make this assumption. It follows that

$$\frac{\partial v_2}{\partial x_1} = \frac{\partial v_3}{\partial x_1} = ... = \frac{\partial v_n}{\partial x_1} \tag{4}$$

In addition, if we make the linear assumption, inverse demand will be

$$P(X) = a - b\,(x_1 + x_2 + ... + x_n) \tag{5}$$

and then, we get

$$\frac{\partial P(X)}{\partial x_1} = -b \tag{6}$$

Hence, substitute equation (6) into (3), the first-order condition with respect to x_1 is

$$P(X)-b(1+(n-1)\frac{\partial v_k}{\partial x_1})x_1-C_1^{'}(x_1)=0 \tag{7}$$

To simplify equation (7), we get

$$-b(n-1)\frac{\partial v_k}{\partial x_1}x_1=C_1^{'}+bx_1-P(X) \tag{8}$$

Therefore, we get the "conjectural variations" as

$$\frac{\partial v_k}{\partial x_1}=\frac{P(X)-bx_1-C_1^{'}}{b(n-1)x_1} \tag{9}$$

Appendix B

A "Conjectural Variations" Model: Duopoly Case

As we describe earlier in Chapter Five, the first-order condition is

$$\prod_i^i = p + x_i\, p'\, dX/dx_i - c^i = 0 \qquad (1)$$

which, after noting that $dX/dx_i = dx_i/dx_i + dx_j/dx_i = 1 + dx_j/dx_i$, can be rewritten as

$$\prod_i^i = p + x_i\, p'\, (1 + v_i) - c^i = 0 \qquad (2)$$

where $v_i = dx_j/dx_i$. Variable v_i is referred to as the "conjectural variation". By rewriting first-order condition (2), we get

$$x_i\, p'\, (1 + v_i) = c^i - p \qquad (3)$$

$$v_i = (c^i - p)/(x_i\, p') - 1 \qquad (4)$$

We suppose that $\eta(X)$ is the positive elasticity of market demand, $-(\, dX/dp\,)\, (p/X)$, and s^i is the market share of firm i. Thus,

$$v_i = -(\, p - c^i\,)\, \eta(X) \,/\, [-(dX/dp)(p/X)(x_i p')] - 1 \qquad (5)$$

Also due to $p' = dp/dX$, to simplify equation (5), we get

$$v_i = (\, p - c^i\,)\, \eta(X) \,/\, (p x_i/X) - 1 \qquad (6)$$

Therefore, finally, the conjectural variation is

$$v_i = (\, p - c^i\,)\, \eta(X) \,/\, (p s^i) - 1 \qquad (7)$$

Appendix C

Trans-Tasman Shipping Operators

Company	Vessel	Capacity
1. UDL (Union Shipping + ANZDL):		
Dedicated Services (3):	Union Rotorua	658TEU
	Union Rotoma	828TEU
	Union Rotoiti	658TEU
Cross-traders (7):	Direct Kooaburra	1500TEU
	Direct Kea	1500TEU
	Direct Curranong	1150TEU
	Direct Condor	1150TEU
	Direct Falcon	1000TEU
	Direct Eagle	1000TEU
	Direct Kiwi	1000TEU
2. BHP Transport:		
Dedicated Services (3):	Iron Dampier	947TEU
	Iron Flinders	922TEU
	Tranztas Trader [a]	1034TEU
Cross-traders (9):	Packing	925TEU
	Pacprince	1224TEU
	Pacprincess	1224TEU
	Mayor	925TEU
	Humbolt Current	692TEU

Australia Current	852TEU
Rossel Current	692TEU
California Current	692TEU
Gulf Current	692TEU

3. Trans-Tasman Shipping Alliance: (TEL + SPS + P&ON)

Dedicate Services (8):	Wellington Express (TEL)	370TEU
	Sydney Express (TEL)	370TEU
	Ranginui (SPS)	180TEU [b]
	Rangiora (SPS)	180TEU
	Rangitata (SPS)	180TEU
	Tainui (SPS)	180TEU
	Takitimu (SPS)	180TEU
	Turakina (SPS)	180TEU
Cross-traders (21):	Depending on P&ON Global Arrangement	

Note: [a] In January 1998, BHP announced that the Tranztas Trader will be replaced by another smaller container-ship, which will be more suitable in trans-Tasman liner trade.

[b] It is estimated according to the information about SPS in the NZ *Shipping Gazette* (12/1997).

Source: NZ *Shipping Gazette* (various issues), NZ Shipping Federation (1997), and personal communication.

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