

THE PETROL INDUSTRY: DEREGULATION, ENTRY AND COMPETITION

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NZ Trade Consortium Working Paper No. 12

2001

**THE NZ TRADE CONSORTIUM IN ASSOCIATION WITH
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The authors acknowledge the assistance from FRST grant number 98-IER-13-6379.

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INTRODUCTION

The petroleum industry was deregulated with the enactment of the *Petroleum Sector Reform Act 1988*. The objective of deregulation was to increase competition within the industry, and thereby to bring to the economy the benefits of greater efficiency and lower prices. The effectiveness of this policy has been difficult to gauge. For example, some people suspect that the oil companies have colluded for years, and have made supernormal profits at the expense of consumers. They point to the fact that a price change by one company typically is followed by identical changes by the others, with the result that competing service stations in the same areas invariably charge identical prices. On the other hand, deregulation appears to have led to improved quality of service at service stations, and recent new entrants seem to have stimulated price competition. The purpose of this paper is to use a market structure-conduct-performance framework to analyse the industry, both before and after deregulation, as a means of judging the impact of deregulation in terms of competition and welfare.

We start in the following section with a very brief history of the industry in New Zealand, and follow this with an examination of the regulatory framework which applied until 1988, and developments post-deregulation. Then the background demand and supply conditions which underlie structure and behaviour in the industry are considered. This is followed by an examination of the industry's structure, which covers the nature of the product, market concentration, vertical integration, and barriers to entry. Conduct patterns in the industry with respect to the nature of competition, price and non-price behaviour, and entry, are then discussed. This culminates in an assessment of the performance of the industry, with particular emphasis being given to the impact of recent entry on pricing. Finally, we draw together our conclusions.

HISTORY

The Companies

There are currently six wholesale suppliers of petroleum products in New Zealand, although seven have previously entered the market. In order of entry (with dates), they were (using their current names) Mobil (1896), Shell (1912),

Caltex (1920), Europa (1931), BP (1946), Challenge (1998), and Gull (1998). The early entrants were importers of the products of their overseas' parents. It was only with the completion of the Marsden Point refinery in 1964 as a joint venture by the original five entrants that the country became a producer of refined petroleum products.

BP entered in 1946 by forming a local company in which the Government held a 51% share, although commercial control rested with BP. A network of storage depots was built, with imported products first arriving in 1949. In 1955, the Government sold its 51% share to the London-based parent. The company acquired a 60% share in Europa in 1972, and the remaining 40% in 1977. By the late 1980s all Europa stations and products had been re-branded BP.

Europa was the only “home-grown” business amongst the original five entrants, having been established by the Todd family in 1931 as the Associated Motorists Petrol Company. Initially, the company sourced petrol supplies from the Soviet Union, but switched to supplies from the United States after 1936.

In April 1998 the first new competitor in petrol retailing since deregulation—Challenge, a division of Fletcher Challenge Energy—entered. A second entrant—Perth-based Gull Petroleum—opened for business in December 1998. Subsequently, Melbourne-based Liberty Oil announced its intention to enter the petrol retailing market, but has not yet done so.

The Refinery

The National Government announced in 1957 that the country should have its own oil refinery in order to save foreign currency, encourage industry development, and gain strategic security for a basic resource.¹ BP and Shell were invited to build the refinery jointly, but the companies' head offices in London considered the proposal not worthwhile on several grounds: their priority lay in rebuilding or extending plants damaged in the Second World War; the country's

¹ This brief survey draws heavily on Paterson (1991).

demand for petroleum products, atypically, did not match the refining yield from crude oil;² and in any case the market was too small to support a refinery.

The new Labour Government elected in 1958 brought urgency to the quest for a refinery. In May 1959, Shell, the company with the largest market share at that time, agreed to build a refinery able to process two million tons of crude oil annually, which would meet 90% of the country's petroleum needs. Inducements offered by the Government included help with finding a suitable site, and the possibility of market protection. This unexpected news caught the other four oil companies—BP, Caltex, Europa, and Mobil—by surprise. Fearful of losing sales and value of previous investments, they demanded—and were given—shares in what then became a joint venture. The five were allocated 68.57% of the shares of The New Zealand Refining Company Limited (registered in 1961), split between them according to their market shares, with the balance going to public tender. Shell was to manage the new facility, which was to be a contract refiner for its owners.

Marsden Point, at the entrance to Whangarei Harbour, was eventually chosen in 1960 as the site for the new refinery. It met the requirements for deep water access and a safe harbour for the tankers carrying the imported crude oil, and for a large area of flat, stable land not prone to earthquakes on which the structures could be built. Labour was available locally, and services such as electricity and water could be brought in. The drawback was that the site was not particularly close to the main markets for ease of distribution of the refined products.

The refinery, which started production in April 1964, was designed to use the bare minimum of plant, a relatively small labour force, and have the scope for future expansion as circumstances dictated. To overcome the mismatch between market demand and product yields, the imported crude oil had to be spiked—at extra cost—with imported, partly refined, lighter feedstock (“naphtha”). Capacity

² Demand was mainly for “lighter” products such as petrol and aviation fuel, whereas petroleum yielded mainly “heavier” products like diesel and fuel oil.

was 2.5 million tons of feedstock per year, enough to meet the country's estimated 1967 petroleum needs.

Demand for refined petroleum products increased faster than expected, and the refinery was unable to meet demand by the mid-1960s. However, a decision about expansion was deferred pending an evaluation of the gas and condensate discovery offshore of Taranaki, later called the Maui field. Although the delay would increase the ultimate cost of expansion, the condensate find could potentially contribute significantly to the refinery's feedstock requirement. Then the 1973 international "oil crisis" intervened. Finally, in May 1975 the Government announced approval in principle for an expansion estimated to cost \$160 million which, by including a catalytic cracker, would eliminate the costly dependence on naphtha to produce the desired product-mix. The expansion, at the Government's insistence, would also involve the building of a pipeline from the refinery to Auckland. This would add substantially to the country's limited storage capacity, and reduce the cost of transporting fuel to the country's major regional market for petrol.

However, the oil companies were not keen on the project because they believed that they had enough surplus capacity elsewhere in the world to meet demand which could not be met through the existing refinery, and in any case the refining company was not able to finance such an expansion. During the 1970s the refinery was meeting only a part of the country's demand for petroleum products, and its age and limited technology made for a lack of versatility in terms of supply. The intervention of the second oil crisis of 1979 led to car-less days, rising oil import bills and further petrol price rises, making the refinery expansion attractive both economically, and for security of supply reasons as overseas supplies of refined products at reasonable prices could not be guaranteed. This extra pressure led to Government approval in April 1979 for an expansion involving a catalytic cracker, at an estimated cost of \$321 million. However, the funding remained a stumbling block, with neither the companies nor the Government being willing to provide their support to the consortium of banks, without which funding would not be forthcoming. In 1980 the impasse was broken when the Government effectively gave a guarantee, under which the loan

would be serviced through its petrol pricing policies. The project was costed at US\$950 million, a much higher figure than expected, although it was still regarded as an economic investment. In the following year Government approval was given for the \$55 million, 170 kilometre, Marsden Point-Wiri pipeline.

The technical nature of the refinery expansion was modified to allow for the building of the Mobil synthetic fuel plant using Maui gas, which was to come into production in 1986. This both reduced the size of the expansion—although it remained very large, with much of the old refinery having to be rebuilt to mesh with the new—and the need for it to produce a lot of extra petrol (given that the overall goal was that of national self-sufficiency). A hydrocracker, which was more expensive but could be run so as to produce diesel and aviation fuel, was preferred over a catalytic cracker which produced mostly petrol. Arrangements had to be made to placate the fears of the other oil companies that Mobil would gain an unfair advantage in petrol through its part-ownership of the synthetic fuels plant, combined with the fact that the refinery's supply of petrol would not meet the country's needs.

The refinery expansion was dogged by frequent, serious labour relations disputes which, by causing delays and raising costs, led the Government to enact draconian, site-specific, labour legislation in mid-1984 which included a requirement for the then entire sacked workforce to return to work. The project was finally completed a year late on 30 May 1986 at a total cost, including the pipeline and Wiri tank farm, of \$1,848 million. As a result of these developments, by 1990 New Zealand was more than 60% self-sufficient in petroleum products.

However, it has been said that if today there were no refinery at Marsden Point, then one would not be built, unless substantial supplies of crude oil were discovered in New Zealand. The desire to save foreign exchange by undertaking the refining process domestically no longer exists, and it would be cheaper to import the finished product from Australia or Singapore.

REGULATORY BACKGROUND

In the mid-1980s there was a sea change in views about the efficacy of the prevailing “heavy-handed” forms of regulation of the economy.³ In the case of the petroleum industry, officials became increasingly sceptical of what the regulations were achieving. It was recognised that regulating any business is difficult and expensive, and that rigid controls like price controls are likely to stunt the efficient use of resources. The abolition of Government controls, and their replacement with a more market-based approach, were seen as the way forward.

Nature of the Regulations

Prior to 1988 the oil industry in New Zealand was highly regulated. Controls, mainly statutory, applied to supply, to distributor licensing and separation, and to prices and margins.

Supply Restrictions

The *Industry Efficiency Act 1936* required that all wholesalers and retailers of petroleum products were licensed by the Government. The licensing of wholesalers probably acted as a deterrent to entry rather than as an absolute barrier, although other barriers of a structural and behavioural nature also played a part. For example, from the 1960s the existing wholesalers had an agreement with the Government (the refinery support letters) to use the refinery to its maximum feasible level, and to co-operate over the coastal shipping system, which potentially raised difficulties for a new entrant. As a consequence, most petrol sold in the country was sourced from Marsden Point, although increasingly prior to the expansion the refinery was unable to meet demand.

In retailing, licences were issued by the Motor Spirits Licensing Authority on the basis of a number of criteria, including the need for outlets to service particular areas. The fact that licences were site-specific and held in perpetuity had the undesirable consequence of tending to lock-in licensed sites to that use. This in turn prevented rationalisation of local distribution in accord with changing market

³ It was said half-jokingly that the country was the “Albania of the south”, and that the economy was “run like a Polish shipyard”.

conditions, and led to new demand being met by the issuing of additional licences. The upshot was a proliferation of licences, and an excess of small service stations, the opposite of what had been intended. In 1986 the average petrol throughput per outlet was around 700,000 litres, about half that in Britain and a third that in the United States (Clough *et al.*, 1989, p. 8).

Separation of Wholesaling and Retailing Functions

The *Motor Spirits Distribution Act 1953* prohibited (with some exceptions) wholesalers from obtaining retail licences. This regulation was introduced in response to the shift from multiple-brand to single-brand service stations, which allowed wholesalers to tie-up outlets for their exclusive use as a means of protecting their market shares, and of foreclosing potential entrants.⁴ At that time BP, in which the Government was a majority shareholder, had been experiencing difficulties post-entry in getting access to multiple-brand outlets, and had in response bought sites to bolster its market presence. This had raised calls for an agreement to stabilise market shares by ending site acquisitions, which later influenced the form of the legislation. However, because of loopholes in the Act, all of the oil companies owned small numbers of outlets (Clough *et al.*, 1989, pp. 25-26).

The regulation did not prevent an individual owning more than one service station or licence. Hence, retailers sometimes responded to the power of wholesalers by forming groupings and buyer co-operatives.

Price and Margin Controls

The control of prices and margins was designed to protect consumers on the one hand, and to allow suppliers a reasonable return on the other. The *Motor Spirits (Regulation of Prices) Act 1933* allowed the Minister of Energy to control the prices of all motor spirits, including petrol, by setting maximum and minimum prices. This legislation was in response to the entry of Europa, whose strategy of undercutting the prices of the overseas-based incumbents provoked a “price war”. The company and petrol retailers

⁴ This is a “requirements contract”, under which a buyer contracts to buy all of its requirements of a particular product, or group of products, from a single supplier. In petrol retailing this type of arrangement is known as “solus trading”.

petitioned the Government which, with opposition support, quickly enacted the 1933 Act, although it was not enforced until 1935 after a petition from a large group of retailers (Commission of Inquiry, 1976). This regulation allowed wholesalers a return of 13% on all assets allocated to wholesale distribution, thus establishing a single wholesale price at all ports and a single price at the retail end.

With the advent of the refinery, other prices were brought under price control. The refinery charged a processing fee, or refiner's margin, calculated broadly as the difference between the price of Middle East crude and the posted world prices for its products, to which was added a cost of freighting those products to New Zealand. The regulated prices for finished products were thus heavily dependent upon agreement over what was the prevailing world price for crude oil. An investigation by Inland Revenue begun in 1963 found that the oil companies had been setting too high a transfer price for their supplies of oil imported from their overseas parents so as to reduce their tax liabilities in New Zealand. The overseas-based companies settled one-by-one during 1968, but Europa took the matter to court, finally meeting with defeat in the Privy Council in 1970. It was also argued that in assessing the transport loading, the companies were overstating their costs by using relatively small tankers as the basis for setting costs. Subsequently, an inter-departmental committee was set up to negotiate annually with the oil companies the accepted prices for crude oil, refined products and freight rates both for imported crude oil and for coastal shipping of finished product (Paterson, 1991, chaps. 9-10).

In 1968 the Government unilaterally decided to set the refiner's margin which, after negotiation, was fixed at 44 cents per barrel of crude oil and feedstocks processed. This rate was based on a formula which allowed the refining company to recover its costs—operating plus depreciation on an historic cost basis—together with a 12.5% net return on shareholders' funds. This formula continued until the industry was deregulated in 1988, although the 44 cents fee was increased several times from 1975. The relative prices of different products were fixed in relation to overseas posted prices, to which was added the appropriate freight cost, to get a notional import parity relativity. To these was added the Government-fixed wholesalers' margin, which was based on storage and

distribution costs together with a fair return on assets,⁵ and a retailers' margin, to give the price to the retail customer.

The wholesale prices were set a year in advance based on notional costs, since at that stage the actual costs could not be known. The differences between the two that emerged at the end of the year were recorded either as a credit (actual costs < forecast costs) or a debit (the opposite) in a special pool account, and these were carried forward and integrated within the following year's pricing. This process had the effect of smoothing annual fluctuations between actual and notional prices, but caused a lag in the adjustment of prices to changes in longer term costs. At deregulation the oil companies argued that the pool account was in debit, which justified an increase in prices.

The wholesale distribution of petroleum products by coastal shipping was organised by the oil companies on a cooperative basis, with the total cost to all ports being allocated in proportion to their individual off-takes from the refinery (Clough *et al.*, 1989, p. 17). Consequently, all faced the same unit cost of coastal shipping, and the transportation to ports distant from the refinery was cross-subsidised by that to near ports. Inland transportation was organised by each company in competition with the others.

The upshot of the regulations—the common ex-refinery price, price equalisation in coastal shipping, and retail price control—resulted in all consumers in all parts of the country paying the same pump price.

Deregulation

The aim of deregulation was to expose the industry to market forces as a means of promoting efficiency, although some questioned whether the domestic market was large enough to sustain an industry structure that would be fully competitive, especially given the entrenched positions of the four incumbent wholesalers. Much reliance was placed on the potential for entry, despite the presence in wholesaling of what were thought to be significant entry barriers. One problem,

⁵ Individual companies could earn returns either above or below the industry average. Also included in the calculation of the wholesale price was a local authority tax on petrol and diesel introduced in 1971.

in the absence of the statutory prohibition, was the perceived ability of the wholesalers to integrate forward into retailing, and then by discriminatory pricing to undermine the viability of independent retailers. Local concentration of ownership could then reduce competition. Such fears were supported by the history of collusion in the oil industry overseas (Clough *et al.*, 1989, p. 13).

A special problem for the deregulation of the petroleum industry was posed by the new refinery. In the early 1980s the international price of crude oil, which had increased enormously under the “oil crises” of 1973/74 and 1979, began to fall. This undermined the worth—in terms of the substitution of imported oil products—of the “Think Big” projects sponsored by the Government, including the refinery. Over the period 1984-87 leading up to deregulation, the possibility of closing the refinery was considered by officials because of concerns that it would be uncompetitive in a deregulated environment.⁶ With hindsight, this seems unlikely from a purely economic perspective, given the proportion of refinery sunk costs, although in financial terms, the value of the assets would fall to reflect their new value in the changed environment. At the time, concerns were raised that closure would have a drastic impact on unemployment in Northland.

The Refining Company feared that the oil companies might not support the refinery in a deregulated market, as they had done previously on the basis of the refinery “support letters”, because they might be able to import product more cheaply from their overseas refineries. In its 1987 *Annual Report*, the Company noted that it had undertaken the refinery expansion at the behest of the Government as part of a strategy designed to reduce the country’s dependence on imported fuels, and that if the industry were to be deregulated, the refinery would be forced to close if it had to compete with imported refined products.

In the July 1986 Budget the Government had introduced a package to take over the Think Big debts. This included the re-financing of the loans for the refinery expansion, with their subsequent amortisation and interest repayments being funded from an Excise Duty rather than, as initially, by a direct levy on transport

⁶ “Keep refinery, says study”, *New Zealand Herald*, 3rd March 1988 (reporting on a study by BERL).

fuels. The Government then repaid the lenders on behalf of the Company. Subsequently, the *Petroleum Sector Reform Act 1988* enabled the Crown to assume the liability for the balance of the Eurodollar Expansion Loans on 9th May 1988. Nonetheless, the Company is amortising the Loan Settlement Payment at the same rate as the depreciation of the assets.

The Government entered into negotiations with the oil companies about what support mechanism was to be used post-deregulation to enable the refinery to “compete”—given that the Company was to forego its rights under the Support Letters to protection against imported refined products—with the options being tariff protection or lump sum payments. The latter was chosen. A figure of \$85 million to be spread over three years was agreed to on 3 May 1988. Six days later the industry was deregulated with the enactment of the *Petroleum Sector Reform Act 1988*, which at one stroke removed all of the controls over the wholesaling and retailing of petroleum products that had been accumulated over the previous fifty years.

In the new environment the refinery was set on its own. Capital requirements for future plant modernisations would have to be generated by the company. The controls on refinery profits, which had related to profits on the 95% of the assets funded by taxpayers and motorists, were removed. At the same time, the oil companies had been freed of any obligation to purchase from the refinery, and so contracts and charges had to be negotiated with the oil companies in the shadow of potential import competition. An import-parity pricing formula was (and is) used based on spot Singapore prices. The one year contracts entered into from 1 October 1988 reflected the low refining fees internationally at the time. These fees are quoted in US\$, and hence the Company’s revenues are influenced by changes in the NZ\$ exchange rate. For example, a weakening of the NZ\$ against the US\$ improves revenues, and vice versa.

For retailers, the *Petroleum Sector Reform Act 1988* had the effect of removing both the price controls on all motor spirits (price control on diesel was removed in 1987), and the prohibition on petroleum wholesalers vertically integrating downstream into retailing. For wholesalers, reform meant—in addition—the

removal of controls on prices and on the returns on assets, the availability of imported refined products, and the end of licensing, which removed any statutory barriers to new entrants.

Developments Following Deregulation

A 1989 report by the Ministry of Energy (1989, pp. 1-2) identified seven developments expected in the deregulated environment:

- intensified competition and sporadic price wars in the major urban areas;
- regional wholesale price differentials reflecting variations in transport costs;
- volume concentration of retail sales through larger outlets;
- diversified use of outlet sites with expanded accessory and grocery stores;
- relocation of outlets from restricted inner city sites to sites with lower land values;
- wholesaler acquisition and franchising of strategic sites, to secure market shares; and
- continued niche markets for smaller suburban and rural outlets.

These forecasts turned out to be remarkably accurate, apart from an apparent lack (until recently) of significant price competition. This lack is probably explained by the absence of new entry. The possible stimulus to competition from an independently-minded wholesaler outside of the four disappeared when the two largest independent chains of retail outlets were acquired by BP. The Top Group, the then largest retailer with 22 service stations in the North Island owned by Brierley Investments and Fay Richwhite, was purchased in August 1988. Shortly afterwards, BP signed a long-term contract with Solo Energy (nine stations). It seems likely that Top Group was not established to be a long-term competitor, but rather to buy prime sites not available to the wholesalers in the pre-deregulation period, and then to sell out at higher prices once the wholesalers were able to acquire sites.

Under the pressure of competition, regional variations in petrol prices appeared quickly, reflecting variations in land (but not sea) transport delivery costs, while retail outlets

expanded their stores. One source claimed that for super petrol the average rural price was 0.2% higher than the average urban price in May 1988, but 1.7% higher by March 1989, with a similar pattern for unleaded petrol.⁷

Deregulation also accelerated two other trends.⁸ Firstly, the oil wholesalers increasingly required payment on delivery at service stations, whereas previously a week's grace had been given. Because stations work on fine margins, this loss of credit was typically transferred to account holders and fleet customers. Secondly, there was a drop in the number of alternative fuel (CNG and LPG) outlets, caused by three factors: a declining demand attributed to a fall in the relative price of petrol; the fact that self-service is not permitted by Government regulation, which increases service station costs; and the unwillingness of the oil wholesalers to offer alternatives to their own brands.

Following deregulation, the oil companies as wholesalers began to acquire high volume retail sites, and to tie up other independents with long term contracts, both to gain market share and to maintain it against rivals, including the new co-operative groupings. One observer compared the rush to Otago in the gold-digging days.⁹ The focus was on the top 400 stations, a fifth of the total, which were pumping 60% of the fuel. In this process, many garage workshops were excluded from the acquisition deals, leaving them to continue under separate ownership or be closed down.

Service station involvement allowed the oil companies to improve the brand imaging of their affiliated service station outlets, both owned and contracted, by introducing uniformity of service standards, promotion and layouts, and to install new computer and accounting systems.¹⁰ BP alone is said to have spent \$16 million on "re-imaging", involving the absorption under the BP banner of the Europa brand it had acquired in 1977, as part of a total of \$1 billion spent worldwide. Wholesalers were also quick to use television advertising for their brand

⁷ "Oil industry deregulation", *Consumer Voice: Current Consumer Issues, No. 1*, August 1989, p. 3.

⁸ E. Scott, "Petrol price rumpus", *New Zealand Financial Review*, vol. 7(10), 1988, pp. 16-18.

⁹ G. Hawkes, "Oil companies in a sweat", *Marketing Magazine*, September 1989, pp. 33-37.

¹⁰ D. Stuart, "Pumping gas: it's a brand new game", *Management*, July 1988, pp. 126-127.

promotions. Shell sought to gain an advantage by being the first to introduce unleaded petrol.¹¹

BACKGROUND CONDITIONS

The application of the market structure-conduct-performance model requires a prior evaluation of the industry's "background conditions". One such condition is the economic regulatory framework, which has been covered under a separate heading above. Given the currently unregulated nature of markets, the focus here switches to the underlying demand and supply conditions.

Demand Conditions

In the year to September 2000, most of the demand for petroleum products by energy content stemmed from the various transport sectors, as the following breakdown indicates: 73% was used by land transport, 15% by air transport, and 7% by sea transport, leaving 5% used by non-transport purposes (Ministry of Economic Development, 2001). More than half of all fuel sales are to bulk customers in Government, transport and industrial undertakings, with diesel sales being prominent. The demand for petrol is spatially distributed, reflecting the population distribution, with about three-quarters being in the North Island, about half in the three largest cities, and nearly a third in Auckland (ACIL, 1997, pp. 12-13, 22, 25).

Over the period 1985-95, the demand for petroleum products grew by more than 4% per year, which was faster than in most OECD countries. Within that total, the demand for diesel grew by 5% annually, and for petrol by nearly 3%. Petrol demand was boosted in the late 1980s by the abolition of Government financial incentives to use CNG, which led to a decline in CNG usage, but was slowed in the 1990s as an increasing proportion of newly registered vehicles were diesel-fuelled because of the lower taxation on diesel.

In recent times there has been a shift in the production—and hence in the use—of petrol from leaded to unleaded, with regular unleaded petrol being introduced in

¹¹ Hawkes, *op. cit.*

1987. The importation and production of leaded petrol stopped on 1st January 1996. Two grades are now sold—unleaded regular (91-octane) and unleaded premium (96-octane)—with the former accounting for about 76% of demand.

An important feature of the demand for petrol is its low price elasticity, meaning that buyers do not greatly reduce the quantity purchased when the price rises. Two estimates for New Zealand are -0.2 (Miller, 1989, p. 11) and -0.26 (Baas, Hughes and Treloar, 1982). This relative lack of price responsiveness no doubt reflects the absence of close substitutes for petrol, especially in the short-run. Economists often classify goods with low price elasticities as “necessities”.

The lack of substitutes for petrol probably arises in two ways. Firstly, the fuel component makes up a relatively small proportion of the cost of running a motor vehicle. Once the investment has been made in a vehicle, its continued use is then not usually deterred by rises in petrol prices, and is often required because of other life-style choices associated with vehicle ownership. However, buyers’ choices in the longer term are less constrained by previous investment and other decisions. In response to a sharp and sustained rise in price, the size of the vehicle can be reduced, car makers can design and produce more fuel-efficient cars, and people can move house closer to their workplace or use alternative modes of transport. As a consequence, the long-run demand curve for petrol is likely to be more price elastic.

The second factor making for a price inelastic demand for petrol is that it is a derived demand: petrol is not wanted for its own sake, but rather because it is an input in the production of the final service desired, such as the “car trip” (or the activity made possible by the car trip). The demand for petrol is thus derived from the demand for this final service. Hence, the elasticity of the former will be influenced by the following general factors applicable to derived demand curves:

- the relative cost of the input in the total cost of the final product;
- the elasticity of factor substitution (the ease or difficulty with which that input can be substituted for by other inputs); and

- the price and cross-price elasticities of demand for the final product (i.e., the responsiveness of buyers of that product to changes in both its price and those of substitute products).

Low elasticity is suggested by the fact that the petrol cost is likely to be a small proportion of the cost of the final product, and the absence of close substitutes for petrol as an input.

An illustration of longer-term adjustments to a sharp rise in price occurred in New Zealand in response to the first “oil crisis” of 1973-75. The Organisation of Petroleum Exporting companies (OPEC), which in the 1970s accounted for about 60% of world crude oil production and about 90% of world oil exports, first used its economic muscle at the time of the Arab-Israel war in October 1973. The price of a barrel of oil was increased from about US\$3 to over US\$5, and then in 1975 to more than US\$11, making for an overall increase of almost 300%. Internationally, the price rise had various repercussions: it encouraged energy conservation (e.g., smaller cars, better house insulation), a switch to cheaper substitute fuels (e.g., coal, natural gas), further exploration leading to the discovery of new oil fields outside of OPEC, and a world recession which led to a slump in the demand for oil.¹² In New Zealand over the period 1974-77, petrol consumption per registered car fell from 2,005 to 1,850 litres per year, and the proportion of newly registered cars having an engine capacity of over 2.6 litres fell from 37% in 1973 to only 10% in 1977 (Paterson, 1991, p. 97). This suggests that the demand for petrol is more price elastic over the longer-term during which users can more readily adjust their consumption patterns.

Demand for petrol by households and others (but not bulk buyers, who have contracts at discounted prices with the oil companies) is expressed through purchases at service stations. From a service station’s perspective, the demand for petrol is composed of large numbers of sales on a daily basis, with sales being concentrated at weekends and during holiday periods such as Easter. Company market share depends strongly upon each capturing as many sales as possible. As motorists’ choice of retail outlet is

¹² See Pickford (1994, pp. 184-85) and the references cited therein.

influenced by convenience and proximity to home, outlet location is of paramount importance. Hence, the companies compete to gain access to the most lucrative sites in urban areas along arterial roads and at busy intersections.

Factors which influence buyer behaviour are revealed by a (somewhat dated) 1987 survey of 1,003 petrol buyers in five, mostly rural, regions (AGB McNair, 1987). The main findings were as follows:

- loyalty to a particular outlet was high, with most (83%) consumers always or mostly using the same outlet;
- proximity to home was the main reason (54%) for choice of usual outlet, with a distant second reason being better service (26%);
- a majority attached importance to service provision, in terms of the availability of a pump operator, an attendant to check oil and tyres, and a mechanic; and
- petrol price reductions did not provide much incentive for the majority of respondents to drive greater distances to obtain petrol.

These findings indicate that motorists typically bought locally, suggesting at first sight that from a demand-side perspective, the petrol retail markets might be quite localised in geographic extent. However, in urban areas at least the natural “catchments” of outlets are likely to overlap, so that if one were to try to raise its prices many of its customers would switch to buying from an adjacent outlet. The scope for overlapping catchments is likely to unify the markets into larger urban ones. Thus, for example, an outlet in Wellington is unlikely to compete with one in Porirua or Petone, but outlets dispersed around Wellington might well compete, and hence fall in the same geographic market. Nonetheless, the number of competing stations in each market is likely to be low, even in densely populated urban areas where the greater demand can sustain more outlets. At the other extreme, in remote rural areas with small populations, the local service station is likely to be a monopolist.

Supply Conditions

The vertical structure of the New Zealand petroleum industry is outlined in Figure 1.¹³ Processing centres on the Marsden Point refinery, which uses both imported crude oil and locally produced crude oil and condensate, roughly in a 9:1 ratio.¹⁴ An oil refinery converts crude oil into more valuable products like petrol, aviation fuel, diesel, fuel oil and bitumen (joint products). The expansion in the 1980s increased Marsden Point's capacity from 75,000 to 95,000 barrels per day,¹⁵ and widened its product range. Today, its main outputs are petrol, diesel, fuel oil and aviation fuels. The refinery operates on a tolling basis, under which it allocates time on its facilities to each of the oil companies, who supply their own feedstock and determine their required product mix, and charges for processing accordingly. Time is allocated on the basis of company market share, calculated as a three year rolling average for all products combined, so that a company with a growing market share will receive more time, and that with falling share will receive less. Sales of petrol to independent retailers does not count as part of that wholesaler's market share (Scott, 1997, p. 37). Presumably, this would discourage incumbents from selling petrol to new entrant retailers.

The output of the refinery is insufficient to meet domestic demand. It competes with imported refined products (mainly petrol and diesel), which currently make up about a third of domestic consumption. Formerly, its petrol output was blended with varying amounts of synthetic gasoline from the Motonui synthetic fuels plant.¹⁶ The four incumbents rely on imported petrol to varying degrees, while the recent entrants—Challenge and Gull—initially used it exclusively, though they now also buy from the refinery. About two-thirds of the local production of crude oil and condensate is exported, as is a very small amount of refined product.

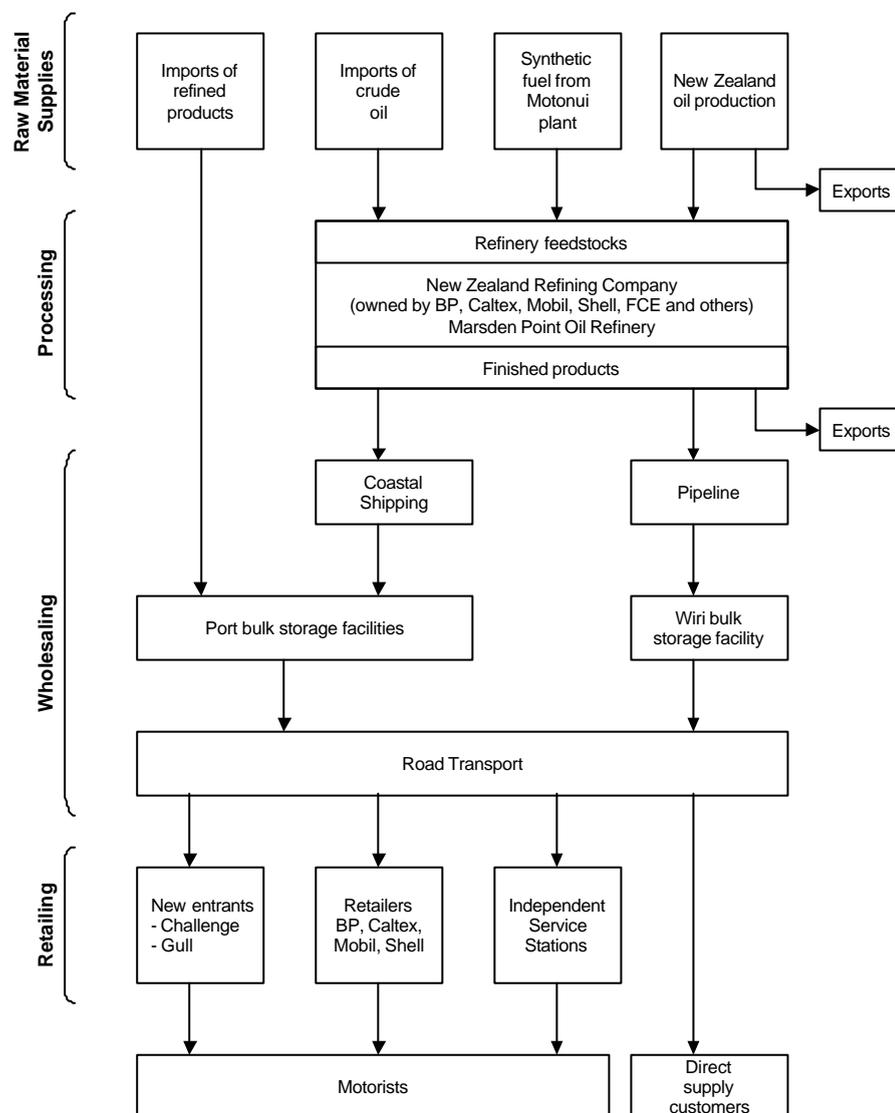
¹³ Figure 1 and the accompanying industry outline draws heavily on Ministry of Economic Development (2001, pp. 6, 34-39).

¹⁴ Condensate is a light crude oil present in natural gas deposits. Crude oil is imported from Saudi Arabia, the United Arab Emirates, Australia and a number of other countries.

¹⁵ A "barrel" is equivalent to 159 litres. About 8.55 barrels weigh one tonne.

¹⁶ Note that there has been no synthetic petrol production since February 1997 as the plant was switched completely to methanol production, because of the higher price obtaining for methanol as compared to petrol. In April 1999 Methanex permanently closed the methanol to petrol unit at the plant.

FIGURE 1
Structure of the New Zealand Oil Industry (excluding exploration)



Notes: the new entrants use only imported refined products.

The major shareholders in the refinery company are the four major oil companies: BP, Caltex, Mobil and Shell. Fletcher Challenge had a 14.3% stake for a time, but sold it in October 2000. The four major companies are the major wholesalers and retailers of refined products, owning between them (until recently) all of the bulk storage facilities, and owning or contracting with most of the retail outlets. In March 1998 Challenge entered the wholesale market, importing petrol through New Plymouth, and began retailing in April 1998. It subsequently built a storage

facility in Timaru. Gull started retailing in Auckland and the Bay of Plenty in December 1998, and in April 1999 opened a petroleum storage depot at Mount Maunganui.

One-third of the refinery production is transported by the pipeline to the Wiri bulk storage facility, both of which are refinery-owned, although the latter is leased to a company owned by the four oil majors. This supplies the major Auckland petrol market. Petroleum products are shipped from the Marsden Point refinery by the four major wholesalers to 12 ports around the country by Coastal Tankers Ltd., which is owned jointly by those companies.¹⁷ The total cost of ship transportation is distributed between the wholesalers in proportion to their output from the refinery and usage, resulting in an averaging of the costs—and hence to a rough equalisation of prices—across all centres, an outcome known as coastal cost equalisation. As a result, consumers in regions closer to the refinery whose supply entails a lower cost, such as Auckland, are cross-subsidising those who live in more distant, higher supply cost, regions. Scott (1997, p. 36) suggested that this practice emerged under regulation in response to equity concerns of the Government. Its continuation post-deregulation may reflect import parity pricing by the incumbents in the face of the fact that imports potentially could be landed for the same price at any New Zealand port (subject to the availability of storage facilities).

At the time of deregulation, the four major wholesalers had separate depots at each port, with the exceptions of Timaru which had no Mobil or Caltex depots, and Whangarei and Bluff, neither of which had a Shell depot. Since deregulation, storage has undergone some rationalisation to reduce excess capacity and gain scale economies, so that not all of the companies are represented at all of the ports. For example, in 1997 the ports with less than four depots were: Whangarei (2), Gisborne (1), Napier (3), Lyttelton (3), Timaru (3), Dunedin (3) and Bluff (3). If one of the wholesalers exceeds its own storage capacity (or, as indicated, has no capacity), capacity can readily be leased from the others, a practice common overseas and known as “hosting”. It would be inefficient for each company to have its own storage at all ports, given the economies of scale in

¹⁷ The Company operates three tankers. The major depots are at Mount Maunganui, Wellington (Seaview) and Lyttelton. The other depots are at Whangarei, Auckland, New Plymouth, Napier, Nelson, Westport, Timaru, Dunedin and Bluff, but these have limited storage.

storage. Such mutual co-operation benefits each of the incumbents, but might hinder an entrant if it were to be denied access on similar terms.

The companies also operate “borrow and loan” arrangements at the wholesale level, under which they borrow and lend product to each other under bilateral agreements relating to each regional terminal. Coastal Tankers plans the distribution around the country based on information about product demands in each region from the oil companies, with a view to minimising transport costs, rather than to ensuring that there is a match for each company between deliveries of its product and its demands in each region. Ensuing differences between the two for each company are met by borrowings and draw-downs between the companies. These are reviewed quarterly, with deficit companies being required to bring more to the market next period. Over the short-term a company is required to balance its demand for refined product from what effectively is a common pool, and its input into the pool of product either via the refinery or by direct importing. By these means the wholesalers, each of whom operate national distribution networks, seek to optimise their use of coastal tankers in the delivery function, and to rationalise regional facilities in the storage function. The coordination also extends to managing stock shortages at any port (Scott, 1997, pp. 33-35).

The product only becomes differentiated by company at the point where the retail delivery trucks are loaded and company-specific additives are added. Inland distribution by road tanker to service stations, inland depots and direct supply (bulk) customers is conducted independently, with the majors using a mix of their own tankers, owner-operators and independent transport companies. This provides one potential source of cost difference between the majors, the other being the cost of the raw materials used. There appears to be no scope for regional rationalisation, since national marketing by each company requires it to have a presence throughout the country. The use of rail and of inland storage depots declined sharply after the mid-1980s when the constraints on road freight transport were abolished. Petrol has a fairly long shelf life of three to six months, but storage costs mean that deliveries are made frequently. The sizeable nature of each delivery imposes substantial short-term working capital requirements on service station owners (Bollard, 1990, p. 131).

As Challenge originally imported through New Plymouth only, and had to truck from there, it was not economical for it to deliver to the distant Northland and East Cape regions. However, subsequently it entered into “borrow and loan” arrangements with an oil major, and a purchases/sales arrangement with Gull (through its Terminals New Zealand subsidiary), and was able to buy finished products from the refinery. These developments probably have helped to bolster its competitiveness. Gull has sought to keep costs down by building a terminal in Mount Maunganui and limiting supply to the Auckland to Bay of Plenty regions.

MARKET STRUCTURE

The interest in market structure stems primarily from its expected influence on the behaviour of the constituent firms, and the ensuing impact of both on industry performance. In an early post-deregulation review of pricing in the oil industry, Miller (1989) identified several structural conditions that were thought to cause oligopolistic interdependence between the wholesalers: the few sellers; an homogeneous and non-complex product (at least from a consumer perspective); transactions between sellers and buyers being frequent, stable and numerous (which aids price monitoring by rivals); an inelastic demand (making collusion potentially more profitable); and a history of cooperation between the companies (because of regulation and joint activities). Added to these might be the likely closeness of their respective cost structures, and the fact that the majors are subsidiaries of international companies which meet each other in markets around the world. Miller (1989, p. 56) concluded that:

. . . market conditions in the industry suggest that an understanding of a collusive sort, one not involving direct communication and agreement, but displaying the same results as one—stable prices, high profit return to investment, stable market shares—is a rather likely scenario.

Nature of the Product

A key characteristic of petrol is its technical homogeneity, in that stripped of its brand, buyers would not be able to distinguish the offering of one supplier from that of another. Better informed buyers are also aware that all domestically-produced petrol comes from the one refinery, albeit that it is mixed to varying degrees with imported petrol. Hence, not surprisingly, buyers seem to treat each

brand as being a very close substitute with all other brands, and hence typically will buy from the lowest-priced option. This suggests that the cross-price elasticities of demand between brands will be very high, meaning that a small rise in one company's price will result in a large fall in sales as consumers switch to other brands, and *vice versa*. All this is consistent with the observation that prices of brands are very uniform, if not identical—down to one-tenth of a cent per litre—across a particular locality.

However, in seeking the lowest-priced option, buyers will take into account the opportunity cost of the time and effort involved in finding it, and in travelling to take advantage of what, typically, is a relatively small saving. This behaviour is reflected in the consumer survey mentioned above, which found that purchases were generally made from the most conveniently located outlet. This may account for the occasional presence of limited price variations found within an otherwise unified urban market. Certain outlets may be able to undercut the 'normal' price by exploiting minor demand or cost advantages, or gain a price premium on the basis of a locational advantage or a clientele with an even less elastic demand curve (perhaps because of a high average income level).¹⁸

Buyers may also not respond to temporary pricing discrepancies between adjacent service stations when they are unaware of the differential, as may result from reduced monitoring efforts caused by consistently identical pricing. This situation may arise when one wholesaler's price change is not followed immediately by the others, as happened on 25th November 1999 when motorists in Johnsonville were observed paying two cents per litre more in the BP station than they would have paid in the Shell station 50 metres away on the other side of the road.

Market Concentration

Historically, the petrol industry has been characterised by significant concentration at the wholesale level, and by an apparent lack of concentration at

¹⁸ For example, a service station located very close to the Seaview terminal on Wellington harbour, and on the road to the outlying but well-heeled suburb of Eastbourne, was observed in December 1999 to be charging a premium for regular unleaded of five cents per litre. In contrast, an outlet in central Wellington was offering a discount of one cent.

the retail level. However, the latter assessment has to be qualified in two important ways: firstly, the retail market is highly differentiated geographically, since motorists tend not to travel far to purchase petrol, and so in local markets outside of the main population centres there are many pockets of high concentration if not outright monopoly. Secondly, since deregulation the wholesalers have scrambled to acquire, or tie up by long-term contract, individual sites, thereby replicating to some degree on a nation-wide basis the concentration of ownership at the wholesale level (see vertical integration section below).

The number of retail outlets has trended downwards over many years, as shown in Table 1. In 1990 it was judged that exits “had been most common among small-scale, poorly sited outlets in areas of low demand” (Bollard, 1990, p. 138). The closure of sites—estimated at 317 in the period 1992-96—was accompanied by the opening of 67 new ones, and 68 “raze and rebuilds” (ACIL, 1997, p. 107). In 1998 the number had declined to only 44% of that in 1976.

The variation in outlet size is great, with those in rural areas being predominantly low-turnover, and with most large-turnover outlets being located in the cities. In 1986, 14% of all retail outlets accounted for almost half of petrol sales (Clough *et al.*, 1989, p. 71). At the time of deregulation, rationalisation was expected to continue, aided by the expected acquisition of sites by wholesalers, who had indicated that further rationalisation was required.

TABLE 1
Numbers of Service Stations in New Zealand (selected years)

Years	1976	1985	1986	1990	1996	1998
Numbers	4,131	3,042	2,814	2,500	1,890	1,800
Index	100	74	68	61	46	44

Sources: Clough *et al.* (1989, pp. 26, 72); ACIL (1997, p. 23); J. Weir, “Petrol industry talks of more tough times”, *The Dominion*, 4th April 1998. The figures for 1990, 1996 and 1998 are estimates only.

Note: index base: 1976 = 100.

At the time of deregulation BP/Europa had 33% of the market, Mobil 28%, Shell 22%, and Caltex 17%.¹⁹ In its submission on the Petroleum Sector Reform Bill, the Motor Trade Association noted that while the oil companies claimed that they competed vigorously, they “by a remarkable coincidence manage to maintain, almost to the litre, their unchanging share of the market, year in and year out. This market share has not changed by more than one percent or so in the last 20 years.”²⁰ The stability of market shares is shown in Table 2, although there appear to have been some significant shifts in the last two years.

One measure of market concentration is the Herfindahl-Hirschman Index (HHI).²¹ Using the figures in Table 2, the HHI for petrol wholesaling was 0.264 in 1986, 0.257 in 1996, 0.244 in 1999 and 0.233 in 2001. With an unchanging number of firms between 1986 and 1996, the slight fall in the index must reflect a small lessening in the inequality of their market shares. The somewhat larger fall between 1996 and 2001 reflects the addition of two new wholesalers (albeit

TABLE 2
Market Shares in Wholesale Petrol (selected years)

Company	1967	1986	1994	1996	1999	2001
BP*	31.9	32.4	31.2	29.7	29.0	28.3
Caltex	16.6	16.5	18.0	18.6	16.4	16.7
Mobil**	27.8	28.4	26.7	27.1	25.4	20.4
Shell	23.7	22.7	24.1	24.6	26.0	28.2
Challenge and Gull	N/a	N/a	N/a	N/a	3.0	6.3

Sources: “Petrol price fixing case to continue”, *MG Business*, 30 March 1998; R. van den Bergh, “Shell undercuts BP with 5c rise”, *Dominion*, 24 January 2001. Challenge media release for 1999 figures.

Notes: * Includes Europa in 1967 and 1986.

** Includes Atlantic in 1967.

¹⁹ Scott, “Oil industry deregulation”, *op. cit.*

²⁰ Quoted in: “Oil Industry Deregulation: Has the Consumer Benefited?” *Consumer Voice: Current Consumer Issues*, No. 1, August 1989, p. 2.

²¹ The HHI is used as a summary measure of the size distribution of firms in an industry. It is calculated by squaring the market share of each firm (usually measured in decimal form) and summing. The minimum value of the index approaches zero when there are very many tiny firms, and reaches a maximum value of 1.0 with monopoly. The index value varies inversely with the number of firms, and positively with increasing inequality in the sizes of a given number of firms.

treated as one firm in the calculation) through new entry. However, while the market shares of the entrants remain small, the impact of their entry—by breaking up a stable, long-standing and tightly-knit oligopoly—has been significant.

Vertical Integration

As noted earlier, the enactment of the *Petroleum Sector Reform Act 1988* opened the way for the wholesalers to vertically integrate forwards into retailing. Pre-deregulation they had openly stated their intention to acquire retail sites, and they moved quickly once deregulation occurred. Indeed, it was claimed that even prior to deregulation the wholesalers had surreptitiously acquired sites, and had attempted to place first refusal clauses on supply contracts with retailers if and when their businesses were sold.²² Presumably, this was partly a reaction to the expected increase in competition in the deregulation era. A consequence is that the majors now largely control the retail market.

There are three types of service station ownership and operation (ACIL, 1997, p. 24). The most common is the “dealer owned and operated” type, or independent, which accounts for about 60% of the total. The other two types, accounting for about 20% each, are the “dealer franchise or lessee” type, where the dealer leases the service station from an oil company and markets its petrol, and the “company or agent operated” type, where the station is managed directly by an oil company agent. All stations operate under the solus system whereby the branded fuels of only one oil company are sold. The large volume, strategic sites tend to be company-owned, whereas the independents tend to be lower volume sites, often located in rural areas. Most service stations tend to provide full (attendant) service, although there are a number of unattended, card-operated “fuel stops” which offer fuel at a discount of around 1.5 cents, this presumably reflecting staff cost savings.

The forward integration by oil wholesalers seems to have been designed to capture and protect market share. This motivation appears to be an example of the “Prisoners’ Dilemma” facing oligopolists. Each firm could not afford to

²² View of the Motor Trades Association, quoted in Clough *et al.* (1989, p. 38).

allow the others to gain control of the retail outlets for fear that its market share would be eroded by restricted access to its customers. This is illustrated in Figure 2, which is simplified by assuming only two wholesalers. The four shaded cells show the split in market share between the two firms in the four scenarios determined by whether each firm decides to vertically integrate (“V.I.”) or not (“No V.I.”). In each cell the top right percentage is Firm 2’s market share, and the bottom left is Firm 1’s share. These show that in the scenarios where both firms integrate, and both firms do not integrate, the market is split evenly between them. However, in the scenarios where one firm integrates and the other does not, the former gains a 90% market share and the latter 10% because of the single brand nature of individual outlets.

The analysis proceeds on the assumption that each firm is fully informed about the contents of the matrix in Figure 2, wishes to maximise its market share, and is aware of the fact that its best strategy depends upon the actions of the other. Firm 1 would realise that if Firm 2 were not to integrate, its best option would be to integrate (gaining a 90% market share, as compared to a 50% share); and if Firm 2 were to integrate, its best option would also be to integrate (gaining a 50% share, compared to a 10% share). Thus, the integration strategy emerges as the

FIGURE 2
The Decision to Vertically Integrate

		Firm 2	
		No V.I.	V.I.
Firm 1	No V.I.	50% 50%	90% 10%
	V.I.	10% 90%	50% 50%

best—or “dominant”—strategy for Firm 1, regardless of the strategy adopted by Firm 2. Exactly the same reasoning would apply to Firm 2, whose dominant strategy would also be to integrate. Hence, both firms decide unilaterally to integrate.

Apart from the protection offered for the investment in the upstream facilities, another motive for the forward integration of oil companies may have been to gain control over the retail marketing channel. This would allow the investment in the layout, facilities and uniform branding of the retail outlets which has become a significant aspect of oil company marketing, and which may be important given the homogeneous nature of the product. It is also possible that such investment might be beyond the ability of the average retailer to finance.

Another possible motive for the vertical integration observed in the oil industry is that there may be transactional economies to be gained from conducting bilateral exchange within the firm, rather than by means of contracts between independent firms through the market (Coase, 1937; Williamson, 1987). Market transaction costs are likely to be relatively high when there is a high degree of asset-specificity, a high level of uncertainty, and a high frequency of transactions, in which case vertical integration is likely to be encouraged. However, those factors do not seem to apply to petrol retailing. For example, the specific assets such as underground tanks and bowsers typically are owned by the wholesalers, thereby removing the risks to retailers of investing in those sunk assets and exposing themselves to the risk of exploitation by their supplier. Hence, transactional economies appear not to be a major factor encouraging forwards integration by petrol wholesalers.

Where the upstream and downstream markets are imperfectly competitive or monopolistic, vertical integration can lead to an increase in output, lower prices (improving consumer welfare), and higher profits. This can apply whether the two markets are both monopolies (Perry, 1989), or both oligopolies (Greenhut and Ohta, 1979; Davies, 1987). An important qualification is that the product of the upstream firm must be used by the downstream firm in fixed proportions in its production, implying that the downstream firm cannot substitute another input for that of the upstream firm. The petrol industry fulfils this condition as for every litre of petrol sold by a retailer it requires a litre of petrol from a wholesaler.

Vertical integration can also form a barrier to entry, although in an oligopoly only where all or most of the firms are integrated. The more the incumbents are integrated, the greater the pressure on non-integrated incumbents to become integrated, and the more difficult is it for an entrant in the upstream market to find outlets for its product. An entrant may then be forced to enter at both levels, which raises the size of the investment funds—and of the sunk costs—put at risk by entry.

Barriers to Entry

Immediately after deregulation, Clough *et al.* (1989, p. 58) highlighted a number of potential difficulties for entry into the petroleum industry: access to the refinery and to wholesale infrastructure like the pipeline, wharves and storage; the difficulty of breaking into the market to gain an economically viable share in the face of incumbent response and significant lead times; the fact that the best retail sites were already “captured”; the potential for the pumps and tanks on retail sites owned by wholesalers to restrict the ability of retailers to switch; the fact that independent retailers were tied up by long-term contracts; and the issue of unit costs of imported petrol falling with increasing shipment size, but this having to be traded-off against probable higher storage costs.

Subsequently, a study by the New Zealand Institute of Economic Research (NZIER) (1996) supported the Ministry of Commerce’s view that the importer price margin—the spread between Singapore export petrol prices and New Zealand retail prices net of taxes—had been increasing since 1990, which raised concerns that barriers to entry into petrol retailing might have impeded entry and competition, thereby allowing the oil companies by tacit collusion to raise prices and profits. Given the concern about possible exercise of market power, and the implications for the rest of the economy from higher transport costs, the Ministry of Commerce in 1997 commissioned a study on entry barriers in the downstream oil industry from ACIL Economics and Policy. The study’s terms of reference canvassed further potential barriers: the economies of scale and scope required for a viable importing operation; the interdependence of the four wholesalers and the contractual arrangements between them with respect to port storage and coastal tankers; and the costs associated with obtaining resource consents for new

structures (Ministry of Commerce, 1996). In response to the Ministry's views, and to the NZIER and ACIL studies, Mobil commissioned a report from Law & Economics Consulting Group which criticised the Ministry's interpretation of the importer price margin and argued, like ACIL, that there were no entry barriers (Scott, 1997).

The focus of these studies on the downstream industry acknowledged that it would be impractical for a new entrant to build its own refinery, given that the market is too small to allow the Marsden Point refinery to exploit all of the economies inherent in refining technology.²³ Hence, entry can occur only lower down the supply chain, and probably using imported refined product. This would not disadvantage an entrant, because the incumbents now import substantial quantities of petrol, and it could benefit from the economies of scope inherent in the joint production of refined products by a foreign refinery in much the same way as do the incumbents through their ownership of the refinery.

The Ministry's terms of reference for the ACIL study specified that Stigler's definition of barriers to entry should be used (1968, p. 67):

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.

Commentators have noted that the cost differences referred to in this definition should be long-run differences only. However, depending upon the exact question being considered, this definition could be overly narrow (Lyons, 1988, pp. 26-30). For example, economies of scale and scope would probably not be considered a barrier under the Stigler definition, although they were by Bain (1956, p. 3), who viewed entry barriers more broadly as:

. . . the advantages of established sellers in an industry over potential entrant sellers, these advantages being reflected in the extent to which established sellers can persistently raise their prices above a competitive level without attracting new firms to enter the industry.

²³ ACIL (1997, p. 103) suggested that the minimum efficient scale for a refinery is about twice the current size of the Marsden Point refinery. An entrant could enter by building a new refinery and exporting the bulk of its output, but it is doubtful whether the country has a comparative advantage in refining given its location. Singapore exports a large proportion of its domestically-refined product.

ACIL noted that the absence of entry in the oil industry might reflect “low” profits caused by competition from existing firms or potential entrants, rather than an inability to enter caused by an entry barrier, and that “high” margins might indicate “high” distribution and servicing costs rather than “high” profits. It emphasised that entry costs are not necessarily entry barriers, that entry is never costless, and that new entrants incur costs in entering that incumbents also incurred at the time they entered (ACIL, 1997, pp. 37-40).

It is the potential for entry to occur, rather than actual entry, which is thought to provide a competitive discipline upon incumbents. Hence, the key test is the height of the aggregate entry barrier, and whether it would discourage entry even when incumbents are earning profits greater than the competitive level, rather than evidence of actual entry. In general terms, entry barriers may arise in a number of ways:

- entry may require a substantial investment in sunk costs (including initial business planning and organisation, promotion, and specialised equipment and facilities) which can not be recouped upon exit, together with direct exit costs because of environmental clean-up costs. By adding to the “down-side” risk, these may deter entry in the first place;
- an entrant may face a higher cost of capital because it lacks the track record of the incumbent, and hence entails a higher risk;
- the incumbent may enjoy a “first mover” advantage of lower costs from being first on the “learning curve”, or of superior product differentiation from being able to establish its brand before others appeared;
- its size may allow economies of scale in brand promotion and maintenance;
- the incumbent may credibly be able to threaten potential entrants with strategic forms of behaviour, which would make entry less profitable (especially where sunk costs are a significant component of entry); and
- entry may involve a scale of operations which would be hard to sustain by the share of the market likely to be gained (there are substantially scale economies in bulk shipping and, to a lesser extent, with terminal storage and retail outlet operation).

The critical considerations for an entrant are the post-entry price, and its unit cost given its likely market share, both of which have to be assessed in the context of the changed structure of the market. The ACIL (1997, p. 108) study found as follows: “No permanent or long run cost advantages to incumbents were identified and therefore the conclusion can be drawn that there are no barriers to entry”. However, it conceded that a new entrant could “initially experience a small cost disadvantage” because of the “time to achieve the intended scale of operations”. Scott (1997, p. 1) reached a similar conclusion: “At most, the ‘problem’ seems to be that, in order for a potential entrant to avoid significant cost penalties and risks, new entry must occur at a scale which is large relative to the overall size of the market.” However, he recognised the potential pitfalls associated with entry:

A rational new entrant would have to make complex commercial calculations in order to choose the scale of entry, the distribution of wholesale and retail outlets, internal transport and take measures to offset a range of risks. At the wholesale end there exist potential disruptions to supply and strong economies of scale and therefore ‘lumpiness’ in the physical size of various facilities. At the retail end there are the possibilities of disrupted internal transport and variations in demand which might overwhelm normal storage facilities. The relationship between the optimal economic scale of transport and storage facilities and the price elasticities of demand for the product need careful balancing also. This industry has strong economies of scale in several places in the chain and a new entrant would have to set up their system in such a way as to take advantage of them in order to be competitive. (p. 27)

Scott (1997, p. 29) stated that the difficult trade-off between gaining economies of scale from large shipments of product on the one hand, and the costs of storage when market share is low on the other, “may provide some explanation of why entry has not occurred into the New Zealand market.” This statement comes close to admitting that there may, after all, be significant barriers to entry into petrol wholesaling and retailing.

In addition, there are the costs of distributing the product nationwide to a “thin” retail network. An entrant relying on imported petrol may also incur significant risks, given the constantly fluctuating international price (see Figure 4 below). Small purchases generally cannot be hedged, and deals are often done three to four weeks ahead of the product being loaded, with the spot price being that at the time of loading.

ACIL placed significant weight on the long-standing presence of independents in the Australian downstream petroleum industry (ACIL, 1997, chapter 4). Today, these range from operations that are vertically-integrated from importing to retailing, to those that

specialise at particular functional levels, such as importation, terminal storage, distribution and retailing. According to ACIL, Australian experience indicates that entry is feasible at particular functional levels without the need to replicate the vertically-integrated structures of the majors. Entry at one functional level (e.g., terminals) has encouraged entry at another (e.g., retailing), although it also notes that joint ventures and strategic alliances between specialist companies have been an ingredient in successful operations. The majors appear not to have been able to deter new entry. Indeed, ACIL claimed that they have an incentive to supply new retailers both with petrol, in order to maintain refinery throughputs at close to full capacity, and with storage services. In 1996 over half of the petrol outlets were not controlled by the oil majors, and many sold non-major brands. In 1997 independents were estimated to have 8-10% of the retail market, with the ability to expand their share substantially, although individual retailers were confined mainly to single capital cities, and very few had succeeded in expanding into another.

Given the much larger size of the Australian economy, the number of very large city markets, the presence of ten refineries (in 1997), and the excess refining capacity of the majors relative to their petrol demand (which encouraged them to sell petrol to others), it is questionable how much light that country's experience sheds on the New Zealand industry. In 1997, entry had not occurred, and ACIL suggested "viable entry" in New Zealand would involve not specialist entry, but quite a large, vertically-integrated operation. It was envisaged that the entrant would import through its own terminal to supply 50 outlets of above-average size, at a cost of \$30-100 million depending upon the number of independent retailers signed up (the terminal was costed at about \$25 million, and new service stations in the three main cities at about \$2-3 million each). Access to suitable sites was considered not to be a significant problem, provided the number of outlets was built up gradually over a 3-5 year time span. Options included the reopening of some of the numerous closed service station sites around the country; the development of new sites made viable by new residential and road building; and the switching of existing outlets upon expiry of their contracts with one of the majors (ACIL, 1997, chaps. 5-6).

In the event, ACIL's prediction was vindicated, when entry of this kind occurred in 1998, first by Challenge and then by Gull. The timing of this entry is unclear, when

potentially it could have happened (given ACIL's conclusion that there were no entry barriers) at any time following deregulation ten years previously. It is possible that industry margins had increased to the point where entry finally became profitable, perhaps combined with the "Asian economic crisis" that resulted in considerable excess refining capacity and low refining margins overseas. The latter could have provided an entrant with a short-term window of opportunity to gain a toe-hold in the market.

MARKET CONDUCT

The structure of the petrol retailing industry suggests that oligopolistic interdependence between the wholesalers will be strong. The decisions made by one firm with respect to price and other strategic variables will need to factor in the possible reactions of its rivals. The potential for complex interactions between the firms makes conduct in oligopolistic industries particularly difficult to analyse and predict. A special problem for the petrol wholesalers is how to effect the periodic price changes necessitated by changes in crude oil prices. All companies are under the same pressure to make changes, but none want the stigma, nor to bear the risk if the others do not follow, of being the first to raise its prices. On the other hand, it is easier to lead a price reduction because of the associated positive publicity, and the assurance that others will follow.

Prior to deregulation firms in the petrol industry were unable to compete on price. Even after deregulation lifted that constraint, price competition did not emerge as a significant feature of the market, at least until new entry finally occurred in 1998. This may seem surprising, for although the price elasticity of demand for petrol as a generic commodity is low, as discussed earlier, the demand for the product of one wholesaler is likely to be much more responsive to price changes, assuming that all other wholesalers hold their prices constant. However, a price cutter can not expect to be able to lower its price and gain market share without the others retaliating. Price-cutting is a dangerous strategy for an homogenous product because it is easily and quickly replicated by rivals. Hence, the unwillingness to engage in price competition (whether or not collusion was involved) no doubt reflected a desire to avoid sparking rounds of price-cutting that could only be mutually destructive. Given demand price inelasticity, price

cuts merely reduce total revenue without greatly expanding quantity sold,²⁴ with profits suffering in consequence. Moreover, given the fragmented geographic nature of the markets, many outlets may face relatively little competition. Nonetheless, there were concerns that deregulation would lead to price wars and instability, as happened in Australia, especially in metropolitan areas, when petrol pricing was gradually deregulated (Clough *et al.*, 1989, pp. 48-49). However, as noted above, independents played a part in the Australian petroleum industry from the outset.

The Structure of Prices and Price Trends

A breakdown of the average retail price of 91-octane petrol for the September quarter 2000 is shown in Figure 3. Industry costs made up only 67.1 cents

FIGURE 3
Components of the Retail Price of 91 Octane Petrol (Sept. quarter 2000)

Petrol-specific taxes and levies	GST		12.8 c/l	12.8 c/l	11.1%
	Crown revenue: Petroleum Excise Tax		18.7 c/l	35.0 c/l	30.5%
	National Roads Fund		13.6 c/l		
	Others ^a		2.7 c/l		
Petrol price excluding all taxes and levies	Notional breakdown of petrol costs	Importer margin ^b	19.8 c/l	67.1 c/l	58.4%
		IF & IC ^c	1.9 c/l		
		Singapore price	45.4 c/l		
	TOTALS			114.9 c/l	100.0%

Source: Ministry of Economic Development (2001, Chart I.9c, p. 130).

²⁴ The relationship between the price elasticity of demand, price changes and total revenue from sales is described in most introductory economics texts. See, for example, Pickford (1994, p. 80-81).

Notes: ^a Covers the Petroleum Fuels Monitoring Levy, the ACC Levy and the Local Authority Tax.

^b Covers domestic transportation, distribution and retailing costs, plus wholesalers' and retailers' profit margins.

^c International freight and insurance cost.

(58.4%) of the price of 114.9 cents/litre, with the balance comprising petrol-specific taxes and levies of 35.0 cents (30.5%), and Goods and Services Tax (GST) of 12.8 cents (11.1%). As the large, petrol-specific tax cum levy component does not change with the price, it softens the adverse impact of rises in industry costs on price. Thus, a 1.0% increase in industry costs would cause the retail price to rise by about 0.5%.²⁵ The large tax component in the pump price (and the fact that the tax component varies widely between countries) also conceals the fact that New Zealand petrol is relatively expensive to produce by international standards.²⁶ Diesel is cheaper than petrol because it does not attract any Excise Duty.

A recent random selection of prices around the country on 26th August 1999 is shown in Table 3, providing evidence for the South Island's long-standing grievance about its petrol prices. The major regional petrol market is Auckland, which can be supplied relatively inexpensively via the Wiri pipeline. Distribution

TABLE 3
Random Selection of Petrol Prices
on 26th August 1999 (in cents/litre)

Location	91 octane	96 octane
Kaitaia	96.1	101.0
Auckland	88.9	93.9
Pukekohe	90.9	95.9
Pokeno	95.9	99.9
Waihi	88.9	93.9
Rotorua	89.5	94.5
New Plymouth	89.5	94.9

²⁵ For example, between the March quarter 1999 and the September quarter 2000 the Singapore price rose by 171.9%, but the retail price rose by only 42.0%.

²⁶ N. Macbeth, "The (high) price of fuel self-sufficiency", *National Business Review*, 16th September 1988.

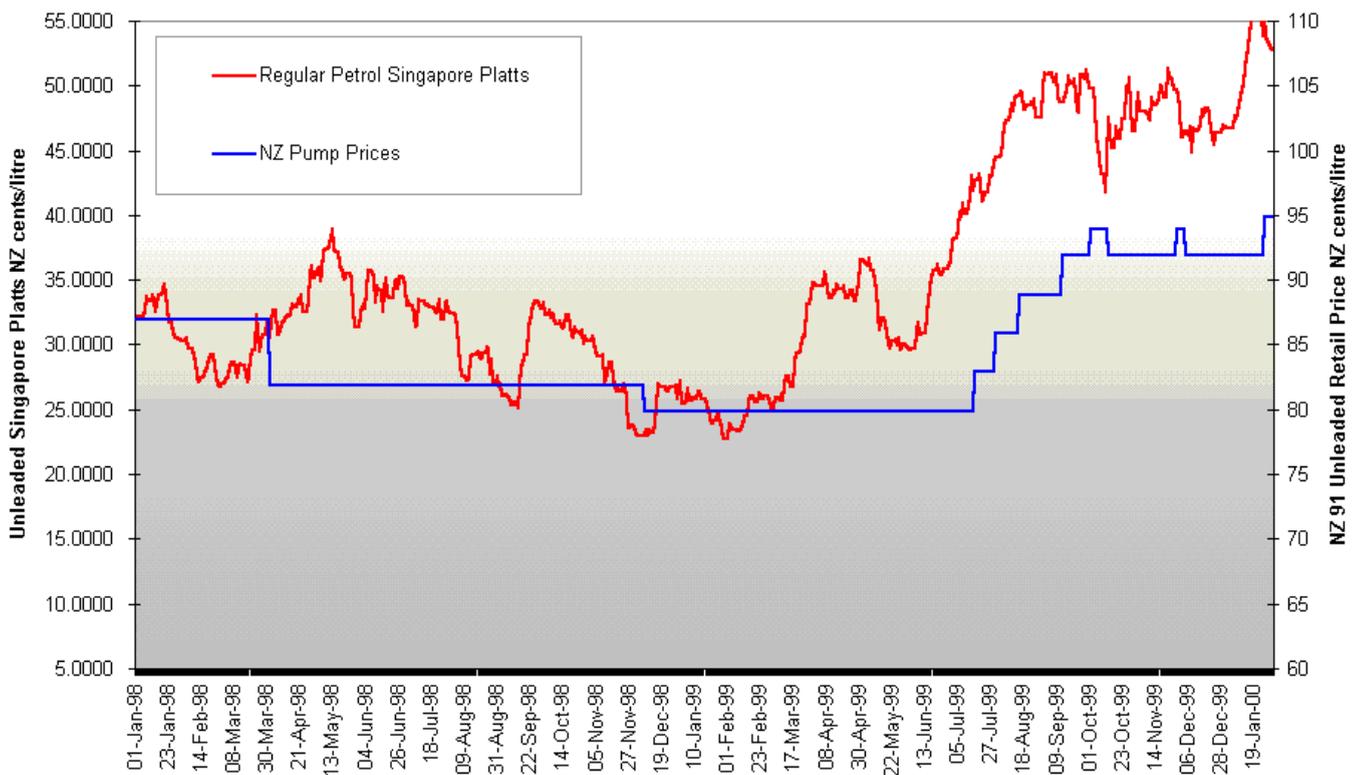
Palmerston North	90.0	95.5
Wellington	89.9	94.9
Takaka	98.0	103.0
Christchurch	91.9	96.9
Franz Josef	101.9	106.9
Dunedin	92.9	97.9
Invercargill	91.9	96.9

Source: M. Williams, "Bowser games: two up, one down", *The Dominion*, 27th August.

costs are higher for the South Island and for remote rural areas, and sales volumes in rural areas are low, although these costs may be offset partially by the lower land and labour costs of service stations in rural areas. Table 3 also shows that 96-octane is usually priced at five cents above 91-octane. Note that fuel pricing uses "focal point" pricing, in that the prices of both grades of petrol are usually quoted to nine-tenths of a cent (and of diesel to half a cent).

FIGURE 4

**Regular Petrol (Platts) and Pump Prices
Jan 1998 to Jan 2000**



Source: Challenge Petroleum.

Petrol price trends over the period January 1998 to January 2000 are shown in Figure 4.²⁷ The smoothly stepped line shows the New Zealand pump price for 91-octane, essentially in the main centres, scaled against the right-hand vertical axis. The sharp price drop in early April 1998 shows the impact of Challenge's entry, while the series of stepped increases from July 1999 shows the industry's response to rising international oil prices. The international price trends are shown in the graph by the fluctuating price of regular petrol sourced from Singapore, scaled against the left-hand axis. What is important is not the relative vertical placements of the two lines, but their trends over time. Throughout 1998 the international price was following a downward (albeit fluctuating) trend, but in early 1999 it turned upwards strongly, reflecting rising international oil prices. Members of the OPEC oil cartel (see below) had managed to resolve their differences over supply restrictions, and at the end of the year a cold northern winter led to increased oil demand.

Pricing in Oligopoly

One model of pricing in oligopoly is the "kinked demand curve" model. Suppose that one of a small group of oligopolists is selling q_1 units of a largely homogenous good at the price p_1 , as shown in Figure 5. The firm recognises the interdependence between itself and its rivals, and is assumed to be pessimistic, believing that the rivals will respond to changes in its price in such a way as to disadvantage it. Specifically, the firm believes that if it were to raise its price above p_1 , rivals will hold their prices constant, so that it would lose a large part (but not all, because the goods are not perfect substitutes) of its sales to those rivals. This elastic demand response is represented by the AB segment of the firm's demand curve, with the corresponding marginal revenue curve being AE. On the other hand, the firm considers that should it lower its price below p_1 , rivals would respond by lowering their prices too, in order to avoid losing market share. This renders the gain in market share experienced by all of the firms small, as shown by the inelastic demand response along segment Bd of the demand curve. The corresponding segment of the marginal revenue curve is Fmr.

At its current output level, the firm thus faces a demand curve which is kinked, and a marginal revenue curve which has a discontinuity over the range EF. The firm's marginal cost curve is shown passing through that gap, confirming the current price and output to be the profit-maximising ones, given its conjectures about the behaviour of rivals.

Suppose that the firm in question is one of the oil wholesalers, and that the price of crude oil—one of its major costs—rises. In Figure 5 the rise in cost would be reflected by an upward movement in the firm's marginal cost curve, but as long as it continued to pass through the vertical gap in the marginal revenue curve, the existing price and output would remain optimal. However, a larger increase in costs would see the marginal cost curve cut the upper AE segment of its marginal revenue curve, as shown by mc' in Figure 6, implying that a price increase would be needed to maximise profit. Other firms would be experiencing the same cost increases, since all buy crude oil at spot prices on the international markets, and all process it through the Marsden Point refinery. Hence, the firm's conjecture that its rivals would not respond to its price increase may give way to an expectation that other firms would follow it, in order to pass the common cost increase through to consumers. This could give rise to a situation where all firms more or less simultaneously raise their prices in the expectation that the others will follow suit, especially in an industry like the oil industry which frequently experiences cost changes, and where prices have to be changed in a co-ordinated way in order to avoid large and unwanted changes in market share.

This process has been called “conscious parallelism”.²⁸ The adjustment to price is shown in Figure 6. If the firm's price rise is followed, it will move along a leftwards extension of the Bd segment of the kinked demand curve (an inelastic demand response) to a new kink point at price p_2 and quantity q_2 , leading to the formation of a new demand curve A'B'Bd, and marginal revenue curve A'E'F'Fmr. Here, the new marginal cost curve, mc' , passes through the new gap

²⁷ The authors express their thanks to Challenge Petroleum for providing this figure.

²⁸ See: Hamberger, 1967; and E. J. Douglas, *Managerial Economics: Analysis and Strategy* (4th edition), Englewood Cliffs, N.J.: Prentice-Hall, 1992, pp. 376-77.

FIGURE 5
The Kinked Demand Curve Model of Oligopoly

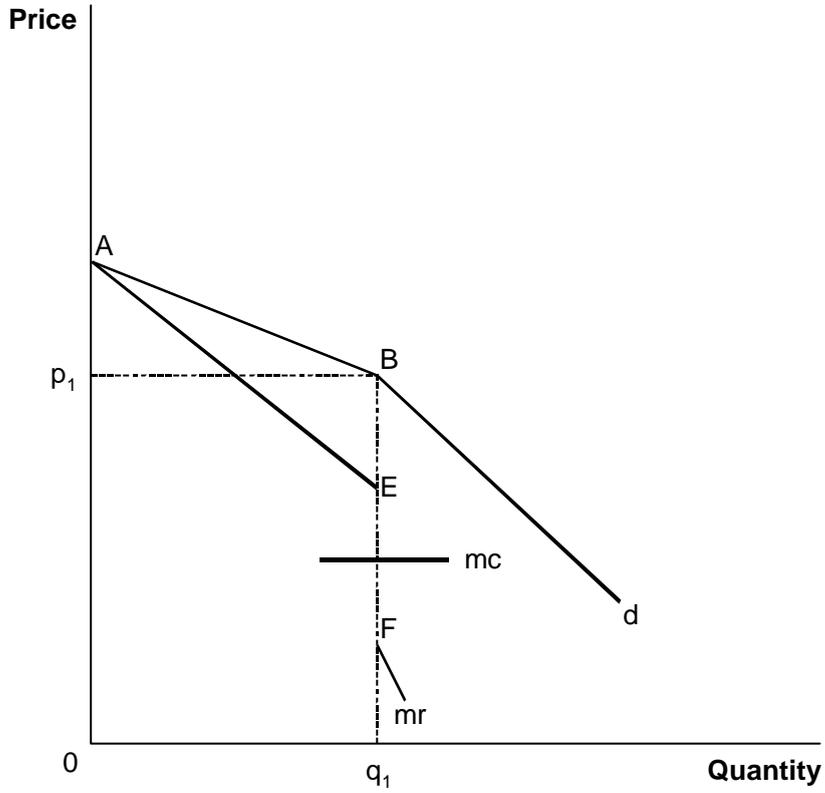
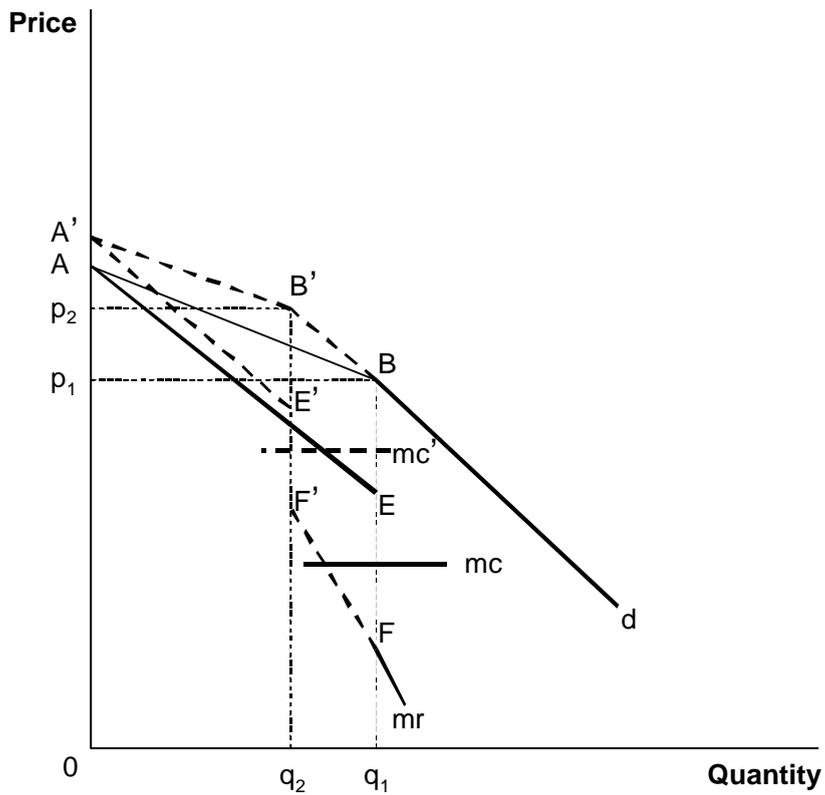


FIGURE 6
Price Adjustment by “Conscious Parallelism” in the Kinked Demand Curve Model



E'F', thereby indicating that equilibrium has been restored at price p_2 and quantity q_2 .

Although the kinked demand curve model does not show how price is set at a particular level, it is useful as a possible explanation as to why retail petrol prices are relatively “sticky” in the face of constant changes in crude oil prices—as shown in Figure 4—and how, with conscious parallelism, the interdependent firms may make necessary price adjustments.

Price Leading and Following

An illustration of price leading and following occurred in July-December 1999 when the oil companies changed their prices ten times in the space of twenty weeks, generally raising them, apparently to recoup the higher costs of imported oil (see Figure 4). The continuation of that trend led to two further petrol price increases early in 2000. The sequence of events is outlined in Table 4. Each of the four major oil companies have taken their turn in leading the increases, with the others, for the most part, soon following. Interestingly, Caltex's increase of two cents per litre in round four was knocked back to one cent by BP and Mobil, perhaps to rebuff its attempt—as the smallest of the majors—to be a price leader. On most occasions Challenge has postured as a reluctant price follower, which is consistent with its advertised image of industry maverick and providing value for money. With the sixth increase it opted to charge one cent per litre less than its rivals for 96-octane, with Mobil and others responding by pledging to lower prices in areas where Challenge was offering lower prices.²⁹

An easing in crude oil prices in October led to an unusually swift response by the oil companies, which lowered pump prices by three cents. A month later Shell attempted to lead another three cent increase, after hinting at an increase four days earlier, but the other companies did not follow, forcing Shell to rescind the increase after it had been implemented.³⁰ Little more than a week later BP successfully led a smaller increase. Overall, BP led five of the 12 changes, as

²⁹ “New twist in petrol war”, *The Dominion*, 2nd October 1999.

³⁰ Cameron Bates, “Petrol prices drop by three cents”, *The Dominion*, 13 October 1999; “Shell petrol up 3 cents – others to follow”, *The Dominion*, 16 November 1999.

benefits the market leader. The three cent increases on 91-octane petrol were accompanied by one cent increases on diesel. Such relatively small changes were probably used to spread the “pain” of the increases, both for consumers, and for the leader whose brand may be tarnished by association with leading price rises.

TABLE 4
Price Leadership and Followership in the
Petrol Market, July 1999 – early February 2000

No.	Date	Leader	Remarks
1	14 th July	BP	The increase of 3c/l on all grades of petrol was the largest single rise in a decade. Shell followed immediately, and the others later.
2	27 th July	Shell	Increase of 3c/l followed by other companies two days later.
3	12 th Aug.	Mobil	Increase of 3c/l, soon followed by most other companies, but BP increases only 2c/l in South Island.
4	25 th Aug.	Caltex	Increase of 2c/l, but Caltex later dropped its prices by 1c on the following day when BP, Mobil and Shell raised their prices by only 1c, with the others (apart from Challenge) following suit.
5	9 th Sept.	Mobil	Increase 3c/l, later followed by other companies.
6	29 th Sept.	Shell	Increase of 3c/l, followed by the other companies on the next day, but later variations caused when Challenge increased 96-octane by only 2c/l.
7	12 th Oct.	BP	Decrease of 3c/l, followed by the other companies the same day, but Challenge restoring its price parity with a 2c/l drop.
8	16 th Nov.	Shell	Shell announced that it was thinking about a 3c/l increase on the 12 th , and followed this with an actual increase on the 16 th . Other companies failed to follow, and Shell withdrew the increase after it had been implemented.
9	25 th Nov.	BP	Following signalling that another increase would be justified, BP raised petrol and diesel prices by 2c/l. The others followed quickly the next day.
10	5 th Dec.	BP	BP and Challenge announced a drop in price of 2c/l., and were quickly followed by the other companies.
11	27 th Jan.	Big 4	All raised their prices by 3c/l at midnight, with Challenge following 24 hours later. On the 24 th Shell had forecast an impending increase of up to 6c/l.
12	2 nd Feb.	BP	Price raised by 3c/l at midnight with other majors following during the day. Challenge followed 48 hours after BP.

A feature of these changes is the apparently close linkage between changes in the price of crude oil and the ensuing changes in petrol prices, even though there tends to be a lag of several weeks between an oil price change and the ensuing change in the cost of the shipped product. This may have reflected the more than usual exposure of the industry to public scrutiny brought about by several factors: the bunching of the price increases; the informal price surveillance by the Ministry of Economic Development; the Commerce Commission's writing of "please explain" letters to each of the companies (Commerce Commission, 1999); and the recent court decision that found that three of the companies had colluded in ending a free car wash offer in Auckland (see below). In addition, the increasing importation of refined product avoids the "refining lag", so that only shipping transit times delay the impact of overseas price changes in New Zealand. Transit times are 5-6 days from the east coast of Australia and 17 days from Singapore.

It has been suggested that the initial delay in the response by the majors to the upward trend in crude oil prices over the first half of the year was a strategy designed to put pressure on the fledgling newcomer. Nonetheless, the cumulative increase in petrol prices was substantial, especially when the taxes and levies component of price was excluded.³¹ An industry rule-of-thumb is that each US\$1 rise in the price of crude oil on international markets equates to a NZ\$0.01 rise in the pump price per litre. The price per barrel of the Dubai crude was \$US 9.77 in December 1998, \$US18.34 on 15 July, \$US19.45 on 12 August, \$US22.46 on 10 September, and \$US 23.90 on 16 November. Hence, between December 1998 and mid-November 1999 the price increased by US\$13.32. With the eighth pump price rise being reversed, prices over the same period had gone up only about 12 cents in total, suggesting that there was a little lost ground to be made up, but not as much as three cents.³² Subsequently, the Dubai crude rose to about US\$30 by early February which, together with the falling NZ\$, put further pressure on petrol prices.

³¹ R. van den Bergh, "Petrol price rises force others up", *The Dominion*, 30th September 1999.

The overseas indicator price of petrol for the Australasia region—the Singapore Platts 92 octane—continued on an upwards trend in New Zealand dollar terms until about August 2000, reflecting a weakening trend in the New Zealand dollar and a strengthening trend in international oil prices. This led to a continuation in the upward trend in petrol prices over the same period. By early September 2000, petrol prices had increased 21 times (although with some reductions, too) since the middle of the previous year to reach a high of about \$1.21 for 91 octane. The concurrent rise in diesel prices had contributed to rises in the prices for rail, ferries, taxis, couriers and groceries. From the end of September, however, petrol prices began to ease, following a stabilisation in the value of the dollar and a decline in world oil and petrol prices.³³

On 19/20 October, with a see-sawing trend in prices, all of the companies raised their petrol prices by 4 cents/litre except Shell, which held off until the 21st, apparently gaining significant extra sales on the Labour Day weekend.³⁴ The same thing happened again with a price increase in mid-November, when Shell held off to give motorists a chance to fill up at the old price.³⁵ In a continuation of this more aggressive pricing stance, and against a background of falling world prices, Shell cut its fuel prices by 10cents/litre on 6 December, leapfrogging the 6 cents cut announced by BP and Challenge, which all companies quickly matched. Shell said that this move, at the busiest time of the year on the roads, was designed to increase the company's market share. This was interpreted as an attempt to supplant BP as the market leader.³⁶ This was followed by another pre-emptive cut of 3 cents on 18 December, which the others followed, and then BP led another price cut on 26 December. But in mid-January 2001 fears that OPEC would cut oil supplies, combined with a cold northern winter, caused the downward price trend to reverse. However, when BP announced a 7 cent rise on 23 January, Shell responded with one of 5 cents. By that point, according to figures made available by BP, it had increased its market share by 0.2% compared to Shell's gain of

³² Similarly, between February and July 1999 the price of bulk cargoes of petrol rose by 50% from around NZ\$0.16 to NZ\$0.24 per litre. See: Ministry of Commerce release of 12 August 1999, quoted in Commerce Commission (1999).

³³ See: James Weir, "Up again – another 3c petrol rise tipped", *Dominion*, 19 September 2000; Colin Espiner, "Petrol price drops", *Christchurch Press*, 27 September 2000; and: Colin Espiner, "Price cut fillip for drivers", *Christchurch Press*, 4 October 2000.

³⁴ "Price rise delay sees Shell reap sales bonanza", NZPA, 21 October 2000.

³⁵ "Major petrol companies bump up prices", NZPA, 21 November 2000.

³⁶ Colin Espiner, "Fuel prices drop 10c", *Christchurch Press*, 7 December 2000.

1.2%, with the other three firms all losing share.³⁷ Sporadic outbreaks of price cutting have continued since (to the time of writing in April 2001), with one-off weekend specials being a feature. Challenge commented that it, like the other companies, was “hurting”, and that “testosterone (had) taken over”, implying a certain irrationality in pricing behaviour.³⁸

Collusion

Some people believe that the parity between the petrol prices of the different wholesalers, and the parallel form which price adjustments take, are indicative of a lack of competition in petrol retailing. Some further believe that the oil companies are behaving collusively to raise prices above the competitive level and to earn excessive profits.³⁹ A former CEO of an oil major told one of the authors that there was no contact between the companies over price-setting, although each watched the others’ pricing very closely. The New Zealand market was regarded as being more “settled” and less fiercely competitive than many overseas, and so the company was expected to be more profitable.

As noted earlier, there are a number of structural features of the industry that are conducive to collusion. Scherer and Ross (1990, p. 208) consider that “firms in an industry with a small number of large rivals may well recognise the benefits from cooperative behaviour, and hence are more likely to believe that rivals will be motivated similarly.” Tacit (as opposed to express) collusion occurs when firms in an oligopoly coordinate their actions without an explicit cartel arrangement. Firms cooperate by keeping their price high or their output low with the understanding that the other firms will do the same, thereby increasing industry profits.

Similar structural and behavioural characteristics influence cartel formation, where the rivals attempt to act like a joint monopolist, restricting output and raising price, and thereby maximising their collective profits. The international oil industry provides the best known example in the form of OPEC. However,

³⁷ R. van den Bergh, “Shell undercuts BP with 5c rise”, *Dominion*, 24 January 2001.

³⁸ “On-going petrol price war testosterone driven – Challenge”, *NZPA*, 2 February 2001.

³⁹ M. Reynolds, “Petrol conspiracy check wanted”, *NZ Herald*, 13th August 1999.

cartels are often unstable for two reasons, as OPEC has shown. Firstly, in the short-run there is an incentive for members to cheat by exceeding their output quotas in order to increase their profits, which can lead to a breakdown in the cohesion of the cartel. Secondly, in the long-run the cartel is liable to be undermined by the entry of new suppliers, attracted by the high price, and by the ability of buyers to substitute away from the good to cheaper alternatives.

The stability of cartels is affected by two major factors: detection and punishment (Stigler, 1964). The presence of detection lags weakens collusion as other firms can only respond to a rival's price cut when they become aware of it. For example, if prices are not easily observed, then the incentive to cheat is greater. The longer the period in which price cuts go unobserved, the longer the period that the price-cutting firm will make extra profits. The opposite applies when detection is swift. In petrol retailing, detection is assisted by the widespread practice of posting prices on large signs at service stations. This openness allows price changes to be detected, and hence responded to, rapidly. By exposing itself to undercutting, and by allowing rivals to detect its price changes readily, the retailer could be interpreted as exhibiting a willingness to play the "price parity game". In addition, rival sales can easily be monitored. Once cheating is detected, firms must also have a means to punish cheating firms. One obvious method in some markets (such as crude oil production) is to flood the market with product to show that price-cutting will neither be tolerated nor be profitable. In petrol retailing a "tit-for-tat" matching price cut seems a likely approach, and indeed, this strategy has been shown in simulations (in the context of repeated Prisoners' Dilemma games) to yield the highest pay-offs by promoting cooperation (Axelrod, 1984).

There are some particular features of the oil industry which further raise suspicions about possible collusion. These are the horizontal arrangements between the companies themselves, and the vertical arrangements between the companies and many of their dealers. As discussed above, the former include the Marsden Point refinery, the Wiri pipeline, the Wiri terminal, and the coastal tankers, all of which are directly owned or controlled by the four majors, together with the "hosting" and "borrow and loan" arrangements between them. ACIL (1997, pp. 29-31) argued that such arrangements are

efficiency enhancing, partly because they yield economies of scale, particularly with respect to the refinery, and partly because they allow all four companies to compete over nationwide networks. They are also a feature of the oil industry overseas. On the other hand, it could also be that such joint activities provide opportunities for company representatives to meet and to develop understandings which could soften the competition between their companies. This appeared to have been a factor behind the collusion in the “Auckland car wash” case outlined below.

Vertical arrangements, in terms of the supply arrangements between the oil companies as wholesalers and their retail dealers, may be more difficult to justify on efficiency grounds. According to ACIL, these typically include such restrictive provisions as the following: lengthy terms and termination clauses (five years and 6-12 months respectively); the supplier having first right of refusal to purchase the site on termination; exclusive dealing (solus) arrangements; and equipment to be owned and installed by the supplier. However, this length of lease may, for the supplier, both facilitate planning (through establishing a stable demand base) and allow sufficient time to amortise the costs incurred in installing tanks, pumps and signage, while giving the retailer security of supply over its principal product (Scott, 1997, pp. 20-21).

Anti-competitive behaviour in markets is prohibited by the *Commerce Act*. Section 27 prohibits contracts, arrangements or understandings that substantially lessen competition, and s. 30 deems that attempts by rivals to rig prices substantially lessens competition, making price-fixing illegal *per se*. Section 36 prohibits firms that are dominant in a market from using that dominance for the purpose of hindering competition. However, while cartels breach s. 27 through s. 30, tacit forms of collusion by oligopolists may not be caught, even though the outcome in terms of price may be similar to that arising from explicit collusion. Evidence of parallel pricing is not sufficient, as there has to be an arrangement or understanding between the collaborators. Price following, where a rival's price change is observed and then followed, is not illegal as the law currently stands. Some consider that the law is deficient in this respect. In a survey concerning the interpretation of the *Commerce Act* in the context of the oil industry, Berkahn (1997, pp. 58-59) concluded:

. . . the interpretation generally given to New Zealand's market dominance and collusion provisions has failed to take account of the unique features of oligopolies. There is evidence that some oligopolistic markets, such as that for the retail sale of petrol, are not competitive, and are thus operating at lower than optimal efficiency, resulting in significant transfers of wealth from consumers to producers as well as 'dead-weight' losses.

The Commerce Commission has successfully prosecuted one or more of the oil companies under the *Commerce Act* in two separate collusion cases. In 1991 BP and one of its sales representatives were fined \$40,000 and \$8,000 respectively for attempting to induce an independent service station in Tokoroa to enter into a price-fixing arrangement, whereby it would cease undercutting the prices of the BP (and other) outlets in the town. Conversations between the independent proprietor (who had complained to the Commission) and the representative were covertly taped and played in court! The breach of the *Act* appears to have stemmed from the actions of an over-zealous sales representative, rather than reflecting the policy of the company.

The second case concerned Caltex, Mobil and Shell, which had begun to offer a free car wash promotion for every purchase of \$20 of petrol in 1994 at their Auckland service stations. The High Court found them guilty of having entered into a price-fixing arrangement when they all withdrew the promotion around 30 May 1996. The free car wash had acted as a discount on the price of petrol, and its removal constituted price-fixing by the companies.

The court inferred that there had been an arrangement or understanding on the basis of largely circumstantial evidence showing a "community of purpose". The promotion had ceased to have a commercial advantage for each company once all had introduced it, since it added to their costs without expanding their sales, yet it was difficult for any one to abandon it unilaterally because of the potential loss of sales to rivals. At the time, senior executives of the companies had been meeting to discuss industry-related technical matters where they had had an opportunity to discuss abandoning the promotion, and some were known to each other socially. The promotions had all ceased on the same day, Caltex had signalled its intention to do so to the other companies, and each had given directions to cease within a few days of each other. The explanations proffered by the companies to explain their simultaneous abandonment of the promotion

were not considered by the court to be credible or consistent with their having acted independently. In fact, the court found that four of the executives had lied either to the Commission or to the court, giving the court a reasonable basis to infer that an arrangement or understanding had been discussed and entered into at those meetings.

New Entry

The recent entry by Challenge was the first into petrol retailing in several years; indeed, since 1977 when BP completed its purchase of Europa, the four majors remained the only wholesalers. Challenge opened on 2nd April 1998 with eight service stations in the North Island, using fuel imported through New Plymouth from Australia and Singapore.⁴⁰ Against a background of falling world prices for crude oil, the four incumbents had over preceding months reduced their prices for 91-octane four times by one cent per litre, and then on the eve of Challenge's entry, by a further five cents in four areas, taking the price in Wellington down to 82 cents. This figure represented a ten year low in nominal terms (a 25 year low in real terms). Challenge did not disclose its price until the last moment, and then entered at 81.5 cents for 91-octane, and 86.5 cents for 96-octane. Rival stations in its areas matched those prices. The entry timing was good because the Easter weekend is typically one of the busiest for service stations, and because it was able to gain most of the credit for what was perceived to be the competition-enhanced fall in pump prices. In addition, it used its New Zealand ownership as a further selling point. However, in a time of falling crude prices, retail prices are expected to fall. The price of Brent crude fell from about US\$21.50 in October 1997 to US\$12.50 in March 1998, although this is the spot price, whereas the majors tend to buy on long-term contracts at fixed prices, which only loosely track the spot price. Moreover, during the period December 1997-March 1998 the NZ\$ fell sharply against the US\$, thereby partially off-setting the gains from lower international oil prices.

⁴⁰ M. Hucke, "Kiwi petrol firm has the good oil on cutting costs", *NZ Infotech Weekly*, 30th November 1998; M. Steeman, "Cheaper petrol spurs reaction", *The Dominion*, 3rd April 1998; M. Steeman, "Liberty vows to cut Challenge price", *The Dominion*, 3rd April 1998; G. Touelle, "Healthy competition finally comes to the petrol station", *The Press*, 13th April 1998; and J. Weir, "Let the petrol price wars begin", *op. cit.*

At the time of Challenge's entry, Melbourne-based Liberty Oil, which had previously announced its intentions to enter the market, said that it could undercut the 82 cent price by ten cents.⁴¹ Subsequently, it indicated that it would enter in the second half of 1999, with plans to establish 35 outlets, but with price cuts of less than ten cents.⁴² At the time of writing (April 2001) entry had not occurred.

By November 1998 Challenge had 15 stations in operation,⁴³ and 20 by mid-January 1999, by which time a market share of about 3-4% was suggested, although this was probably an over-estimate.⁴⁴ In late August 1999 the company announced that it had 37 stations, comprising 17 company-owned and operated sites in the North Island, 14 independent retailers in the North Island, and six independents in the South Island. In addition, there were 17 "fuel stops" in the North Island. The company was also building a \$10 million terminal in the South Island, where 50 independent retailers were expected to join the brand by early 2000.⁴⁵

Perth-based Gull Petroleum commenced retailing on a limited scale in December 1998, using petrol imported from Australia, by opening a service station in Hamilton. 91-octane was offered at 78.5 cents a litre, a price quickly matched by other local stations.⁴⁶ Gull's plan was to build a number of stations in the region between Auckland and Tauranga, and supply them from a new terminal at Mt Maunganui. Four were in operation by March 1999, and 17 by May 2001, with another four being built and five more planned. The company has said that it wants to build at least 40 in the North Island, and that expansion into the South Island was a probability in the longer term.⁴⁷

An outbreak of severe price-cutting was reported in late November 1999 in response to the opening of the first Gull service station in Tauranga, on Hewletts

⁴¹ Steeman, "Liberty vows to cut Challenge price", *op. cit.*

⁴² M. Steeman, "Liberty aims to be in NZ by September", *The Dominion*, 30th November 1998.

⁴³ Hucke, *op. cit.*

⁴⁴ J. Weir, "Petrol industry talks of more tough times", *The Dominion*, 12th January 1999.

⁴⁵ Bob Constantine, "Challenge will not be increasing prices", Challenge Press Release, 27th August 1999.

⁴⁶ J. Weir, "Gull station opens, cuts petrol price", *The Dominion*, 29th December 1998.

⁴⁷ "Woolworths and Gull team up", *Retail Today*, May 2001, p. 10.

Road between Tauranga and Mount Maunganui.⁴⁸ The prevailing price for 91-octane had been 93.9 cents, but when Gull opened at 91.5 cents the three incumbents' outlets—BP, Caltex and Shell—within a kilometre cut their prices to 90.5 cents, whereas outlets on the Tauranga side of the bridge and in the Mount kept their prices at 93.9 cents. Within days the price of 91-octane reportedly had fallen by as much as 12 cents. Caltex's outlet led the way by dropping its price to 81.9 cents from 93.9 cents a week earlier. Gull soon responded by cutting its price from 83.9 to 81.9 cents. Other nearby rivals cut prices to 86.9 and 87.5 cents, especially on the Mount side of the bridge. In contrast, only two kilometres away on the Tauranga side prices remained at 93.9 cents.

The two new entrants both have their businesses concentrated in the large North Island cities. This has led to an increase in competition in those centres, while South Island and rural towns appear to have suffered by comparison. There have been assertions that the four majors are making up for lost profits in centres with new competition by increasing prices in unaffected areas. South Island MPs have called on the Government to put pressure on the oil companies.⁴⁹ Between April 1998 when Challenge entered the market and January 1999, prices fell by 16% in the North Island and only 10% in the South Island. Prices in Nelson were approximately eight cents higher than in Hamilton, a 10% difference which could not be explained by the differential transport costs alone.

Price cuts following entry would have been expected on several grounds: from the possible breakdown in the coordination between the incumbents in what appears to have been a cosy oligopoly; from the increase in the number of suppliers from four to six in the context of a non-cooperative, Cournot- or Bertrand-type market; and from the desire of the entrants to increase their market share in order to spread the substantial costs of the new supply depots over a larger throughput.

The threat of large volume, low margin petrol sales through service stations at supermarkets has so far failed to materialise. In the first half of the 1990s supermarkets

⁴⁸ Pete Kerr, "Gull chief attacks big oil firms for petrol price war", *Bay of Plenty Times*, 30th November 1999; "Motorists save up to 12c a litre in petrol price war", *The Dominion*, 3rd December 1999.

⁴⁹ E. Wellwood, "MPs united in petrol row", *The Press*, 27th January 1999.

in the United Kingdom captured a 23% share of the market, provoking a price war in 1995 (Office of Fair Trading, 1998, pp. 31, 42, 93):

Supermarket entry and expansion has fundamentally altered the dynamics of petrol retailing. . . . Throughput at the average supermarket site in 1996 was 8.6 million litres, around three times the average roadside site. This allows the considerable fixed costs of a petrol forecourt operation to be spread thinly, permitting supermarkets to operate on small margins and offer competitive prices.

Similarly, hypermarkets have about a 50% share of the French market. Woolworths in Australia has opened a large number of service stations in its own car parks.⁵⁰

Non-Price Competition

Given the dangers inherent in using price as a means of promoting sales in a tight oligopoly with homogeneous product—because price-cutting could lead to a price war in which all suffer—oil companies have traditionally focused on non-price forms of competition as a means of differentiating themselves and stimulating extra sales. Given that price cuts by rivals are easily copied, whereas non-price changes usually are not, each company has had to maintain on-going efforts in non-price promotion for fear of being caught napping by the unexpected competitive thrust of a rival. The companies focus on maintenance of market share as the acid test of success, and are extremely sensitive to even tiny (less than one per cent) changes in their shares. Traditionally, competition has manifested itself principally through the gaining of high volume sites, augmented by periodic efforts at promoting the brand and service quality, making “free” offers for a large variety of goods, and providing related services.

As noted earlier, non-price competition—characterised by one observer as “gentlemanly competition”—has resulted in market shares being relatively stable over many years. Nonetheless, it is said that a successful promotion can lead to a market share gain of 1-2% (Scott, 1997, p. 14). The big gainer in recent times has been Shell, which has increased its share by about 3.5% since 1996 despite Challenge’s entry (see Table 2), while Mobil seems to have been the big loser (down 6.7%). A major factor in Shell’s success appears to have been the “Fly

⁵⁰ Weir, “Let the petrol price wars begin”, *op. cit.*; and M. McGuire, “Food and fuel alliance flourishing”, *The Dominion*, 17th February 1999.

Buys” loyalty scheme, in which it is a shareholder and participant. At the end of 1998 the programme claimed a membership of 620,000 households, or 52% of all households in the country. This success encouraged BP to start its own scheme, “AA Rewards”.

Prior to deregulation, non-price competition included attempts at product differentiation. The wholesalers promoted their own ‘special additives’ which, according to advertising claims, made their petrol superior to that of rivals. However, these claims appeared to have little validity, and the strategy had limited success. In one case—Shell’s “Spark Aider”—the supplement initially looked promising, but came unstuck when reports claimed that some Shell-fed vehicles tuned to leaded petrol were “blowing up”. The additive was quickly withdrawn, with the company running a damage control “You can be sure of Shell” billboard campaign thereafter.⁵¹

Shortly after deregulation, BP’s Mike Walshe reportedly said that “the real differential will be in the area of convenience services, whereby we try to make the acquisition of motor spirits a pleasurable experience”.⁵² Hence, the wholesalers do not advertise their petrol, but rather some diffuse aspect of their service which makes them distinctive. Currently, Caltex’s catch-phrase is “we’re pumping”, Mobil is “the quick stop”, BP is “on the move”, and Shell is using the timeless “you can be sure of Shell”. As a result of recent investment programmes, the forecourts at the main service station are now spacious, modern and multi-lane (aiding traffic flow), open on a 24 hour/7 day basis, with a range of car-related (for example, automatic car wash and EFTPOS at the pump) and shop services. All of these factors attempt to make visiting the petrol station a more convenient experience, and to establish a strong brand for the quality of the service offered.

In the post-deregulation period there was an early shift in emphasis from a workshop to a retail outlet orientation. This was an obvious way to diversify so as to increase turnover from sites, since that would take advantage of their

⁵¹ Stuart, “Pumping gas: it’s a brand new game”, *op. cit.*

⁵² Hawkes, “Oil companies in a sweat”, *op. cit.*

drawing power as petrol outlets—an economy of scope—and of the increasing demand for “convenience” on the part of shoppers. The focus on convenience rather than price brought them into competition primarily with corner dairies, which suffered in consequence with closures at the rate of about 30 per month in the early 1990s,⁵³ although service station shops are themselves beginning to face more competition from supermarkets with the lengthening of supermarket opening hours.

The emergence of wholesaler competition in 1998, and the subsequent fall in retail petrol prices and margins, put added emphasis on the value of such product diversification. It is difficult today for outlets to be profitable by relying entirely upon petrol sales. Typically, about half of an outlet’s revenues comes from its convenience store, and the rest from fuel sales and car-related services, with the former growing more quickly. In the case of Caltex, merchandise sales are growing at 15% per year, and fuel sales at only 4%. New and upgraded service station sites may also include independent retail outlets, such as Burger King at some Shell outlets (Shell owns 50% of the franchise in New Zealand).

The wholesalers’ flag-ship branded stores—BP Express, Caltex Star Marts, Mobil On The Run, and Shell Select—are increasingly numerous (about 17% of the total), and are designed with brands and colour schemes to present a uniform image to their customers. These resemble small supermarkets. The emphasis is on stocking convenience items like milk, bread, confectionery, snack foods and magazines which offer good margins and, by being purchased regularly, turnover quickly, rather than a full range of groceries, for which they have insufficient storage and retailing space. Service station shops are said typically to stock about 1,500 items, compared with 1,000 to 1,500 for dairies, 3,000 to 5,000 for convenience shops, and 12,000 to 22,000 for supermarkets. As an illustration of their relative importance, milk sales through these outlets account for about 16% of total milk sales, compared to 40% for supermarkets.⁵⁴ Central overheads are

⁵³ T. Agee, “Do dairies deserve to die?”, *Marketing Magazine*, vol. 10(8), 1991, p. 45; and T.-M. Morrison, “Caltex moves focus from pumping petrol to creating convenience”, *The Dominion*, 29th October 1999.

⁵⁴ Commerce Commission, *Draft Determination: New Zealand Dairy Board et al.*, Wellington: Commerce Commission, para. 368, p. 73.

kept low by using slimmed down administrative systems, and a preference for dealing with one supplier in each product category.

Perhaps the most innovative of the major oil companies has been Caltex, the smallest, with its marketing award winning Caltex Star Marts.⁵⁵ These are intended to be stand-alone operations, and indeed, several have uniquely been established on sites away from service station forecourts in inner city areas of Auckland and Wellington. They are open all the time and target the convenience demand amongst young adults. The first, in Wellington, claims the biggest turnover of any Caltex store. In all cases, Caltex receives from the franchisee a fixed rental and a cut of the store sales. Star Mart profits are expected to contribute close to half of the Caltex group's profits by 2001.

A new competitive development occurred in April 2001 when Gull Petroleum and Woolworths formed an alliance, under which the majority of Gull's sites would be converted to house Woolworths' mini-supermarkets.⁵⁶ These will offer Woolworths' most popular lines at supermarket prices, which, if correct, will put pressure on the prices charged by the convenience stores of the other petrol retailers. Woolworths will manage the partnership sites, with Gull being responsible for petrol pricing and supply, and a joint board will determine future sites.

Conduct Regulation

As noted earlier, the behaviour of oligopolists is subject to the prohibitions contained in the *Commerce Act* regarding collusive behaviour, business acquisitions and the use of a dominant position. Other forms of regulation which impinge upon the oil industry include local planning controls on the siting and layout of service stations, and environmental controls through the *Resource Management Act 1991*. The safety issues associated with the handling of dangerous goods are governed through the *Dangerous Goods Act 1974*, under which every dangerous good installation is licensed, and by the *Land Transport Rule: Dangerous Goods 1999*, which set out requirements for the safe

⁵⁵ K. Lawrence, "A Star is Born", *Marketing Magazine*, August 1999, pp. 33-35; M. Steeman, "Caltex gets serious about cutting costs", *The Dominion*, 5th November 1998; and T.-M. Morrison, "Caltex moves focus from pumping petrol to creating convenience", *op. cit.*

transport of dangerous goods on land. Product quality is regulated under the *Petroleum Products Specifications Regulations 1995* (subsequently amended), which set out the requirements for 91- and 96-octane petrol and for diesel. The *Maritime Transport Act 1994* allows foreign ships to deliver or collect cargoes at local ports as part of a longer international journey, so that foreign tankers are able to deliver to a number of ports, facilitating competition from imported fuel.

MARKET PERFORMANCE

Our prime concern here is with the performance of the industry from a social perspective, which leads to a focus on the three dimensions of efficiency: allocative, productive and dynamic. Of these, that most amenable to numerical assessment is the first, because it relates to pricing behaviour. Two approaches are discussed here. The first is based on the research carried out by the NZIER at the behest of the Ministry of Commerce, which had become concerned about what seemed to be relatively high domestic petrol prices. The second uses evidence of the sharp drop in prices following the recent entry, from which can be inferred the size of the welfare losses induced by the pre-entry prices. However, it is difficult to review a concentrated industry without considering the economic health of the constituent companies, although this is made difficult in the present case by the fact that all of the companies apart from the refining company are privately owned.

Company Performance

A broad financial comparison of the major participants in the oil industry using 1998 data is shown in Table 5. The rankings give the position of each within the top 200 companies in New Zealand. Three of the four oil companies had revenues exceeding one billion dollars, which on that measure put them amongst the top twenty companies. However, three of the four had much lower rankings in terms of profits and return on assets, with the latter in absolute terms being dismal. It seems unlikely that variations in efficiency or costs alone between the companies could explain such large differences. More likely explanations include the following: substantial differences in degree of diversification (for example, Shell is unique amongst the four majors in having

⁵⁶ “Woolworths and Gull team up”, *Retail Today*, May 2001, p. 10.

substantial interests in gas field operations, as well as in petrochemicals and forestry);⁵⁷ the presence of extraordinary items in the accounts; or the companies having different policies with respect to transfer pricing, and hence to the “allocation” of profits within their global oil operations.

TABLE 5
Oil Company Performance Indicators and Rankings, 1998

Company	Revenue (\$000s)	Rank	Profit after tax (\$000s)	Rank	% return on assets	Rank	% return on total equity	Rank
Shell	1,269,229	14	114,349	12	13.2	26	21.5	46
BP	1,222,777	15	22,053	45	3.7	95	33.0	27
Mobil	1,130,292	17	4,919	96	0.9	131	2.2	139
Caltex	683,302	32	18,385	51	2.9	103	8.3	102
NZ Refining	152,564	107	23,593	42	9.2	41	16.1	57

Source: “1999 Top 200 New Zealand Companies”, *Management*, December 1999, pp. 60-73.

The Refinery

Import competition has forced the Company to focus on cutting costs. Between 1987 and 1990 staff numbers were reduced from 535 to 385, although this in part reflected the “learning curve” benefit associated with starting up a complex new refinery, while the maintenance bill was reduced by 60%, partly reflecting the newness of the facility. Port fees were reduced by over 40%, helped by the corporatisation of the Northland Harbour Board to form the Northland Port Corporation in 1988. Improving efficiency has remained an important objective of the Company; for example, the Chairman’s address to the AGM in April 1999 spoke of the intention to reduce 1998-level costs by 5%.

The refinery has been moving towards market-related refining fees and away from cost-based ones. From 1st January 1995 a negotiated arrangement led to the refinery receiving 70% of the gross refinery margin (grm), with the balance going to the oil companies. The grm is the landed price of all the products produced by the refinery less the landed cost of crude oil, both based on quoted Singapore prices (ACIL, 1997, p. 14).

⁵⁷ *Shell in New Zealand: Business Snapshot 1998*, available from: <http://www.shell.co.nz>.

The “Asian crisis” of 1998 and over-capacity worldwide led to under-utilisation of refining capacity in South-East Asia and to tight refining margins. The refinery introduced changes to the processing arrangements in the 1998 annual review whereby it could vary the refining fee for marginal quantities of production to induce its customers not to switch to importing at the margin cheaper finished products from Australia, where there were lower margins than those in Singapore on which the company’s fee margins are based. This reduced the profit on the marginal production, but enabled full use of the plant, allowing overheads to be spread. As a result, the intake of feedstocks first exceeded five million tonnes in 1998, and the Wiri pipeline reached full capacity, necessitating investment in further pumping facilities to increase capacity.

Efficiency and Service Levels

Prior to deregulation, prices and margins were set uniformly across the country, regardless of the costs of distribution. In that environment each oil wholesaler had a profit incentive to hold down costs, since the cost savings would not be passed on in lower prices (even assuming a zealous regulator) unless the other companies also reduced their costs. However, Clough *et al.* (1989, p. 17) argued that efficiency incentives were blunted relative to those in a fully competitive market because cost savings could not be used to compete on price. But as subsequent analysis shows, oil companies have been reluctant to compete on price even when the market was deregulated.

Deregulation imposed a changed mindset upon service station operators, from one centred upon pumping fuel efficiently, to one of running a business in a competitive environment, including pricing (Bollard, 1990, p. 126, 128). As service providers, such outlets may be liable to suffer from the so-called “cost disease of the service sector”. It has been argued in the case of the performing arts that while their wage rates increase in line with those in other sectors such as manufacturing, they have a lesser ability to increase labour productivity, with the result that their unit costs increase (Baumol and Bowen, 1965). However, in the case of petrol retailing, productivity gains have been made by the introduction of self-service pumps, which has substantially reduced labour costs, and more recently by the building of unstaffed self-service sites. Cynics might also argue that the “service” element has been taken out of “service station”! Land and

capital productivity has probably also been raised through the diversification into retailing, and by a relocation of sites from inner city areas to arterial routes outside of central city areas (thereby reducing the opportunity costs of land).

In late 1998 Caltex revealed that falling petrol prices following entry were forcing it to seek ways of reducing costs; in the middle of the year it had lost money for a few months.⁵⁸ For petrol, wholesaler and retailer profit margins were around two cents per litre, although for the latter there was considerable variations between different outlets. However, BP has reportedly stated that retail margins are about four cents, down from eight or nine cents several years ago.⁵⁹ Other oil companies were also shedding staff and restructuring. Small, under-performing sites, especially in rural areas, were being closed when their underground tanks came up for renewal.⁶⁰ Forecourt attendants on a site of medium size had been reduced from three/four to one/two, with a resulting reduction in service levels. Full-service stations are thought likely to disappear. Between 1997 and 1998 Caltex reduced its staff from 360 to about 290, excluding all service station staff employed by the station managers, with a further reduction to 250 by the end of 1999 planned. It was alleged that Challenge had reversed plans to build on several sites in favour of the less expensive option of re-equipping sites vacated by the other companies (at a cost of about \$0.25 million, compared to \$2-3 million for a new station).

The multi-product nature of the oil industry raises costs allocation and transfer pricing issues. Just after deregulation the procedure used to allocate costs was to apportion the total cost of importing crude and feedstocks, refining and coastal distribution between the various products in proportion to their shares of their notional import parity costs (Clough *et al.*, 1989, p. 20). It is not known whether this procedure is still used today.

Price Trends

Since deregulation the Ministry of Economic Development has monitored and analysed retail petrol price trends both through its own staff (Ministry of

⁵⁸ M. Steeman, "Caltex gets serious about cutting costs", *op. cit.*

⁵⁹ G. Sheeran, "Aussie slams petrol rip-off", *Sunday Star-Times*, 15th August 1999.

⁶⁰ A. Dick, "What price cheaper petrol?", *The Independent*, 19th May 1999; and J. Weir, "Petrol industry talks of more tough times", *op. cit.*

Economic Development, 2001), and through sponsored reports on aspects of the industry's structure and behaviour (Clough *et al.*, 1989; NZIER, 1996; ACIL, 1997). In 1989 the NZIER was able to report that while New Zealand had relatively low priced petrol compared to most, though not all, OECD countries, the margin between the landed price of refined petrol and the retail price was one of the highest, and that it had increased over the ten years to 1987 (Clough *et al.*, 1989, p. 2).

In 1995 the Motor Trade Association commissioned the NZIER to explore the relationship between wholesale petrol prices and international oil prices, with the primary concern being the speed at which changes in oil prices and the exchange rate were passed through into petrol prices, and whether the direction of those changes affected the speed with which they were passed on (Featherston, 1995). There was a popular view that the oil companies responded more quickly to rising oil prices by increasing petrol prices than they responded to falling oil prices by reducing petrol prices. Separate price equations for both grades of petrol were estimated by ordinary least squares multiple regression analysis using weekly data for the period from about mid-1991 to the end of 1994. The price of petrol in the current period was made a function of the following: the price of petrol in the previous period; lagged variables representing the change in the oil price and in the NZ\$/US\$ exchange rate (since international oil prices are expressed in US\$); a dummy variable representing a tax change; and a constant term which was interpreted as capturing the impact of oil company cost elements for which data were lacking. For both equations it was found that the lag structures were identical, with changes in international oil prices, and changes in the exchange rate, taking up to six weeks and three weeks respectively to impact fully on the petrol price. There was no evidence of any asymmetry in the response of petrol prices to the direction of change in either of those variables.

In 1996, the NZIER was commissioned by the Ministry of Commerce to write a report on petrol price trends in New Zealand. This showed that New Zealand's retail petrol price, measured in US dollars and excluding levies and taxes, were amongst the highest in the OECD in the years prior to deregulation. In 1985, for example, New Zealand had the third highest price. The years immediately

following deregulation in 1988 saw the ranking improve dramatically, falling as low as 16th in 1991 and 1992. In 1993 the relative price began to worsen again, however, so that in 1995 it was the fifth highest of the 23 OECD countries, and approximately US10c per litre higher than that in Australia.

The NZIER also used an importer margin derived by the Ministry of Commerce, measured as the difference between the domestic retail price and the import price (using the Singapore spot price, lagged by two months to allow for delivery delays) to which international freight and insurance, and New Zealand taxes and levies, were added. This margin is what would be available to an importer to cover domestic distribution, marketing and retailing costs and margins. Expressed in real (1995) dollars, the importer margin in cents per litre showed no significant trend from 1984 to deregulation in 1988, but then steadily decreased through to the start of the Gulf crisis in late 1990. Over following years, there was a steady upward trend of approximately 1.1 cents per litre per year until mid-1996. By late 1994 the importer margin had risen above its pre-deregulation average of 24.4 cents per litre. After analysis, the NZIER concluded (p. 14) that “in competitive conditions, one would expect to see margins squeezed over time, not increasing”, and that “margins can only be increased above competitive levels if there are barriers to entry.” This conclusion led to the report on entry barriers commissioned from ACIL by the Ministry in 1997, as discussed earlier. Subsequently, the margin trend turned sharply downwards.

These findings were challenged strongly by Scott (1997, pp. 4-15), who questioned the data trend analysis, pointed out that the focus on the margins of only two out of a range of joint products was likely to be misleading, and argued that any discernible trends should have been evaluated in the context of the economy-wide and industry-specific conditions prevailing over the period. Relevant economy-wide factors around 1990, such as a recession and a glut of product following the refinery’s capacity expansion, could have resulted in depressed margins and market disequilibrium. Relevant industry-specific factors included the growing significance of fleet card discount sales (which were omitted from the average margin series), the switch from higher margin leaded to lower margin unleaded petrol (which resulted in the growth trend of the weighted

average margin being smaller than that for either),⁶¹ and an apparently quite flat margin trend over the period 1990-96 for a weighted average across all joint products. However, that flat trend must be contrasted with the increased margins for leaded and unleaded petrol of around 31% and 46% respectively (or 28% for the weighted average of the two), which undermines Scott's argument that the oil companies had only limited room to move in taking their margins where they could across the range of joint products.

A comparison series of the average retail petrol price in Auckland with those in the major Australian cities (with all taxes and levies removed), is given in Table 6. Strong competition, in the form of frequent outbreaks of significant price-cutting, is a feature in the Australian cities, especially Sydney and Melbourne, suggesting that their prices might approximate those in a competitive Auckland market. The Table shows that prior to the recent entry, prices were as much as 12-14 cents per litre or more higher in Auckland, but that entry in the first half of 1998 caused that difference roughly to halve. Subsequently, the impact of rising crude oil prices and the associated petrol price adjustments detailed earlier, together with the continuing influence of the competition from the new entrants, seem to have further narrowed the gaps. However, Scott (1997, pp. 40-41) is inclined to discount price comparisons between the two countries,

TABLE 6
Differences in Petrol Prices Between Auckland and Selected
Australian Cities, June 1995 to September 1999*

Selected quarter	Auckland price less Australian city price				
	Sydney	Melbourne	Brisbane	Adelaide	Darwin
Sept 2000	5.0	5.7	4.1	5.5	-5.7
June 2000	3.0	7.2	4.5	6.0	-7.1
March 2000	3.1	5.9	5.5	5.1	-7.2
Dec 1999	5.0	8.4	6.8	6.4	-5.9
Sept 1999	1.1	2.8	1.2	1.4	-6.7
June 1999	3.8	6.0	5.0	5.3	-5.5
March 1999	8.8	10.5	9.2	9.4	-1.0
Dec 1998	6.8	9.5	8.2	8.7	-2.1

⁶¹ Between 1990 and 1996 the margin for leaded petrol rose by about 31% from 19 to 25 cents per litre, while that for unleaded rose by about 46% from 15 to 22 cents. The market shares of the two were about 70:30 in 1990 and 30:70 in 1996, giving weighted average margins of 17.8 and 22.9 cents per litre respectively, an increase of only about 28%.

Sept 1998	5.9	8.6	9.4	7.9	-3.6
June 1998	6.5	9.1	7.8	7.2	-4.4
March 1998	12.8	15.8	14.2	14.9	0.7
Dec 1997	13.7	13.7	12.8	14.4	4.2
Sept 1997	13.1	13.0	14.2	13.6	4.7
Dec 1996	12.9	15.9	14.1	14.7	6.4
June 1995	17.9	19.4	17.5	19.1	11.4

*Note: differences are given in NZ cents per litre, with all taxes and levies being excluded.
Source: Ministry of Economic Development (2001, Table I.9d, p. 130).

notwithstanding their geographic proximity, because of their very different economies, the surplus refining capacity in Australia, and the possibility that petrol prices may be below the competitive level in that country.

Welfare Implications of Price Trends

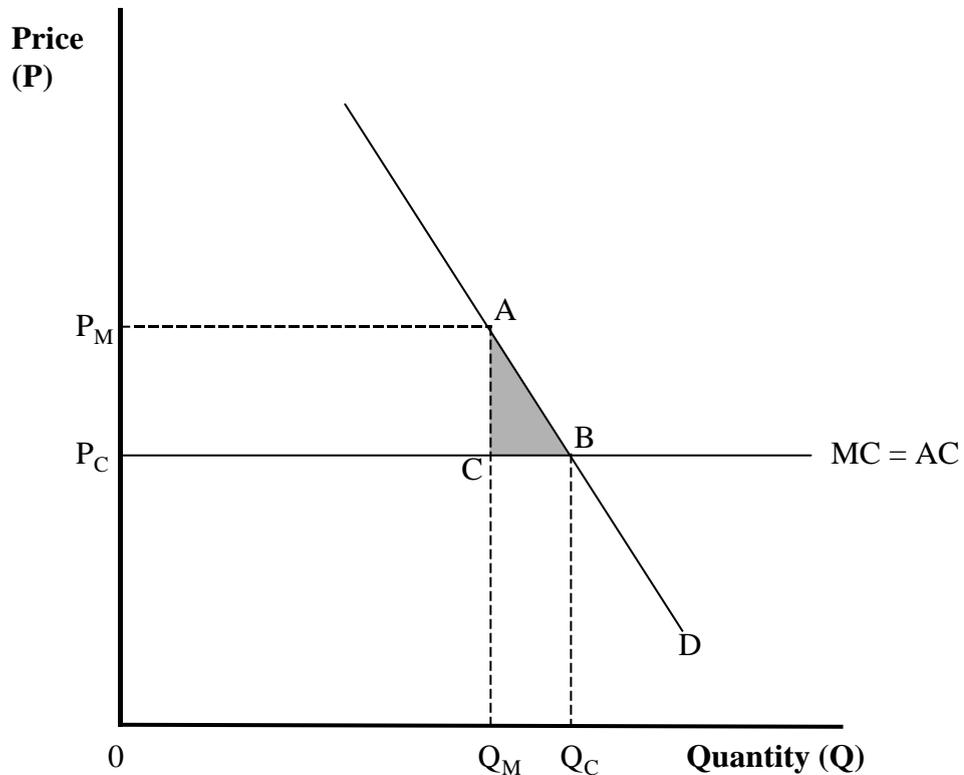
Although deregulation of the oil industry took place over ten years ago, perhaps the most important changes with respect to competition in the post-deregulation era happened in 1998 with the entry of Challenge and Gull. As noted earlier, entry led to a sudden, sharp fall in retail petrol prices which was apparently unconnected with changes in international oil prices. If the new prices can be taken broadly to be sustainable—an assumption the oil companies might question on the basis of recent allegedly low returns—they may approximate those in a competitive market.⁶² If the prices that would have obtained in the post-entry period without entry could be estimated, the extent of the price drop attributable to entry would be apparent. This would allow the previous allocative inefficiency stemming from supra-competitive prices pre-entry to be calculated. Preliminary analysis suggests that entry has reduced the price of petrol by about four cents per litre (Wheeler, 1999, chapter 6).

The impact on allocative efficiency is analysed in a stylised fashion in Figure 7. D denotes the market demand curve. For simplicity's sake, the following assumptions are made with respect to industry unit costs: they are the same for all firms; they are constant, so that average cost (AC) equals marginal cost (MC);

⁶² The oil companies have argued that it is no longer profitable for service stations to sell only petrol, and that they need to diversify into selling other products such as groceries, as discussed earlier. If there are such economies of scope to be had through such diversification, then it is not surprising that competition should be pushing the oil companies in that direction.

and there was no productive inefficiency (costs above the minimum level) when prices were elevated prior to entry. The current outcome, assumed to be the competitive one, is found where marginal cost equals demand at price P_c and output Q_c . Prior to entry, the price was higher at P_m and output was smaller at Q_m . Consequently, the oil companies earned profits in excess of the competitive level shown by the area P_mACP_c , and the deadweight welfare loss was equal to the area ABC . Petrol users suffered by losing consumers' surplus equal to the sum of both areas.

FIGURE 7
The Efficiency and Wealth Transfer Effects from Market Power



The model is calibrated by making the following assumptions: a price elasticity of demand of -0.2 at point A; annual consumption of 2.9 billion litres of petrol; a drop in price by four cents from an initial level of 90 cents/litre; and the distinction between premium and regular petrol being ignored. On this basis, the deadweight welfare loss would have amounted to only \$515,000 per year, this relatively small figure reflecting the price inelasticity of the demand curve. The transfer from consumers surplus to company profits would have been \$116

million, this relatively large figure the consequence of a relatively small proportionate price difference over a very large volume of product. Such transfers are normally disregarded when assessing welfare effects, on the grounds that the dollar gains by one group are exactly off-set by the dollar losses of the other. However, as the four major oil companies are all foreign-owned, from a nationalistic perspective this wealth was not necessarily a transfer to the extent that it flowed overseas (net of company income tax).

CONCLUSIONS

During the late 1980s the petroleum industry, like many other New Zealand industries, experienced a dramatic change in operating environment, from one which involved heavy-duty, industry-specific, economic regulation to one of total deregulation. In response, the structure of the industry changed sharply as the wholesalers moved quickly to become vertically integrated by acquiring, or by tying up in long-term contracts, retail outlets, which had remained independent under the regulations. Conduct changed, too. The refinery had to stand on its own feet in the face of competition from imported refined products, which led it to become very cost-conscious. Competition also forced a shift away from a uniform system of petrol pricing to one where retail prices reflected differences in delivery costs, leading to substantial differences in the price of petrol between the major cities and smaller towns and rural areas.

The aim of the legislation was to increase competition in, and improve the efficiency of, the industry. There is some evidence to suggest that, at least initially, deregulation did have the effect of reducing retail petrol prices against an international yardstick, but that after a few years the improving trend quickly reversed. There were few, if any, outbreaks of price-cutting of the kind that emerged in the larger Australian cities after the deregulation of that country's oil industry. The industry remained tightly oligopolistic in structure, with a ten year period during which no entry occurred, suggesting that the constraint provided by the entry threat was less onerous, and the entry barriers were higher, than the deregulators had hoped. Non-price competition of various types—principally, for prime sites, branding and service quality—was the major tool used by the petrol

companies to maintain or increase market share against the competitive thrusts of rivals.

Entry by a new vertically-integrated petrol wholesaler and retailer first appeared with Challenge in early 1998, and Gull in late 1998, both using imported fuel. The initial impact was to reduce prices by around five cents/litre for 91-octane in areas where Challenge stations opened, and these cuts spread rapidly as the number of outlets increased. The price cuts appear to have become even deeper following Gull's opening, although its outlets were fewer, and were restricted geographically to the region from Auckland to Tauranga. The price competition reduced the profitability of pumping fuel, encouraging the petrol majors to cut costs through rationalising distribution by closing smaller outlets, and to redouble their retailing efforts by expanding their forecourt grocery convenience shops, which now yield about half of outlet turnover.

The entry-induced price cuts suggest that the incumbent companies prior to entry were charging supra-competitive prices, and making excessive profits in consequence. The apparent prior weakness of price competition is consistent with the presence of collusive behaviour. There has been only one instance where the Commerce Commission has brought a case against more than one company, and that involved a non-standard pricing issue (the withdrawal of a free car wash in Auckland), although by its nature overt collusion is often difficult to prove unless one of the parties involved spills the beans. The "leader-follower" pattern of parallel price changes could be seen as a form of tacit collusion, but it is difficult to see how else price changes needed to reflect changes in raw material costs could be introduced, in a market characterised by an homogeneous product and oligopolistic interdependence between firms. However, it is possible that this practice could give rise to an upward bias to prices if one company were to become the recognised price leader, and were able to gain the compliance of the others through signalling intended price changes in advance of their implementation. On the other hand, the companies are likely to be constrained in their pricing behaviour by the scrutiny given to changes by the Government, the Commerce Commission, motoring organisations, the press, and the public at large.

REFERENCES

- ACIL (1997), *Barriers to Entry to the New Zealand Downstream Oil Market: A Report to the Ministry of Commerce*, Wellington: Ministry of Commerce.
- AGB McNair (1987), *Petrol Outlets Survey*, Wellington: Motor Trade Association.
- Axelrod, R. (1984), *The Evolution of Co-operation*, New York: Basic Books.
- Baas, H. J., W. R. Hughes and C. G. Treloar (1982), "Elasticities of Demand for Petrol and Aviation Fuel in New Zealand, 1961-1981", *Technical Publication No. 20*, Wellington: Ministry of Energy.
- Bain, J. S. (1956), *Barriers to New Competition*, Cambridge, Mass.: Harvard University Press.
- Baumol, W. J. and W. G. Bowen (1965), "On the Performing Arts: The Anatomy of Their Economic Problems", *American Economic Review (Papers and Proceedings)*, pp. 495-502.
- Berkahn, M. (1998), "Shared monopolies and Tacit Collusion: Applying Competition Law to the Petrol Industry", *New Zealand Business Law Quarterly*, vol. 4, pp. 87-111.
- Bollard, A. (1990), "The Petrol Retailing Industry", in: J. Savage and A. Bollard (eds.), *Turning It Around: Closure and Revitalisation in New Zealand Industry*, Auckland: Oxford University Press, chapter 10.
- Clough, P., A. Bollard, E. Assendelft and J. Culy (1989), *Issues in Oil Sector Deregulation*, Research Monograph No. 43, Wellington: NZIER.
- Commerce Commission (1999), *Investigation Report into Petrol Price Increases, July-November 1999*, Wellington: Commerce Commission.
- Commission of Inquiry (1976), *The Distribution of Motor Spirits and Ancillary Products*, Wellington: Government Printer.
- Featherstone, Kathryn (1995), *Petrol Price Monitoring: Report to the Motor Trade Association*, Wellington: NZIER, March.
- Hamberger, W. (1967), "Conscious Parallelism and the Kinked Oligopoly Demand Curve", *American Economic Review – Papers and Proceedings*, vol. 57, pp. 266-68.
- International Energy Agency (1997), *Energy Policies of IEA Countries: New Zealand 1997 Review*, Paris: OECD.

- Lyons, B. (1988), "Barriers to Entry", in: S. Davies, B. Lyons, H. Dixon and P. Geroski (eds.), *Economics of Industrial Organisation*, Harlow: Longman, chapter 2.
- Marvel, H.P. (1978), "Competition and price levels in the retail gasoline market", *Review of Economics and Statistics*, vol. 60, pp. 252-258.
- Miller, R. (1989), *Price Setting and Deregulation: The Flour Milling and Petrol Wholesaling Industries*, Wellington: New Zealand Institute of Economic Research.
- Ministry of Commerce, Energy Policy Group (1996), *Terms of Reference: Study into Barriers to Entry in the Petroleum Industry*, Wellington: Energy Policy Group, MOC.
- Ministry of Economic Development (2001), *New Zealand Energy Data File, January 2001*, Wellington: Ministry of Economic Development.
- Ministry of Energy (1989), *Issues in Oil Sector Deregulation*, NZIER Report No. 89/1001, Wellington: Market Analysis Unit, Ministry of Energy.
- New Zealand Institute of Economic Research (1996), *Petrol Prices: An Investigation into Petrol Prices in New Zealand*, Report to the Ministry of Commerce, Wellington: NZIER.
- New Zealand Refining Company Ltd (various years), *Annual Report*, Whangarei: NZRC.
- Office of Fair Trading (1998), *Competition in the Supply of Petrol in the UK*, London: Office of Fair Trading.
- Paterson, M. (1991), *The Point at Issue: Petroleum Energy Politics in New Zealand, 1955-90*, Auckland: Collins.
- Perry, M.K. (1987), "Vertical Integration: Determinants and Effects"; in: R. Schmalensee and R.D. Willig (eds), *Handbook of Industrial Organisation*, Amsterdam: Elsevier.
- Pickford, M. (1994), *The Economics of Markets: A New Zealand Perspective*, Palmerston North: Dunmore Press.
- Porter, M.E. (1980), *Competitive Strategy*, New York: Free Press.
- Scherer, F.M. and Ross, D. (1990), *Industrial Market Structure and Economic Performance* (3rd ed), Boston: Houghton Mifflin.
- Scott, G. (1997), *Conditions of Entry into Petrol Importing, Wholesaling and Retailing in New Zealand*, Wellington: LECG.

- Shaw, R.W. (1975), "Price leadership and the effect of new entry on the U.K. retail petrol supply market", *Journal of Industrial Economics*, vol. 22, pp. 65-79.
- Stigler, G. (1964), "The Theory of Oligopoly", *Journal of Political Economy*, vol. 72, pp. 44-61.
- Stigler, G. (1968), *The Organisation of Industry*, Homewood, Ill.: Irwin.
- Tirole, J. (1988), *The Theory of Industrial Organisation*, Cambridge, Mass.: MIT Press.
- Wheeler, C. J. (1999), *A Study into the Effects of Deregulation of the New Zealand Petrol Industry*, Master of Applied Economics thesis, Palmerston North: Massey University.
- Williamson, O.E. (1987), "Transaction Cost Economics", in: R. Schmalensee and R.D. Willig (eds), *Handbook of Industrial Organisation*, Amsterdam: Elsevier.