

AN ECONOMIC ANALYSIS OF THE 1986  
DEREGULATION OF THE NEW ZEALAND EGG INDUSTRY

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## PREFACE

This research report analyses the economic changes which have occurred in the New Zealand egg industry, since the partial deregulation of April 1, 1986.

This paper is very timely given the forthcoming review of the egg industry production control system. The terms of reference for that review (listed in Appendix A) correspond closely to the content of this research. This research also provides one of the first empirical investigations into the effects of the deregulation of New Zealand agricultural industries. The implications of these findings for the deregulation strategy are noted at the end of the report.

A key finding of the research is that the movement away from industry-specific controls has not yet brought the predicted gains in the welfare of final consumers. This appears to have been due to the continuation of substantial entry barriers into the egg producing industry in the form of the entitlement (production control) system. An associated factor has been the imprecise nature of the general economic regulations, such as the Commerce Act 1986, which replaced the industry-specific controls.

The author, Mr J.K. Gibson, initially conducted this research for the honours dissertation of a Bachelor of Agricultural Science degree. The research was supervised by Dr R.G. Lattimore, a Reader in the Agricultural Economics and Marketing Department at Lincoln College.

Professor A.C. Zwart  
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## SUMMARY

This research measures the costs and benefits of the 1986 reform of the New Zealand egg industry. The main items of this reform were the removal of price, marketing, import and grading controls. Production control remained in a more flexible form.

Prior to the reform there were annual wealth transfers to producers from consumers, distributors and retailers (who operated under regulated margins) of between \$8 and \$13 million. The social costs, when compared with an ideal free market situation, were in the order of \$6 to \$9.5 million per annum. Most of this cost was due to suboptimal size and location of egg producers as a result of production control.

Deregulation caused a significant downward adjustment in producer numbers. Licences to produce (entitlements) were restored to positive values providing compensation for producers leaving the industry. The selling price for hen quotas in the period following deregulation suggested a quota rent of between 14 and 35 cents per dozen eggs. This rent, for participation in a licenced industry, was only possible due to the presence of substantial barriers to entry by new firms, viz, the entitlement scheme.

There was weak evidence that entitlement transferability led to more optimal production scale and location. The exploitation of market power by distributor groups may have affected the regional movement of production by influencing producer prices and output adjustments. Deregulation changed the nature of price setting such that declines in the real price of inputs were not carried through into retail egg prices.

The 1986 reforms produced a small (between four and six cents per dozen) reduction in the wealth transfer to producers from final consumers and marketing institutions. Changing marketing margins indicated that retailers gained some of this wealth transfer by increasing the markup on eggs to a similar level to that on other perishable goods. The average gain for each producer did not change due to the reduction in producer numbers. The social costs after the deregulation were similar to those which had existed previously although the degree of excess supply was declining. This was offset by a greater expectation of quota rent by entitlement holders.



## CHAPTER 1

### INTRODUCTION

The deregulation of the New Zealand egg industry in 1986 provides an opportunity to monitor the costs and benefits of a reduction in the level of regulation of an industry. Whilst there have been several studies of the potential efficiency gains from deregulating egg industries<sup>1</sup> the New Zealand experience allows comparison with the actual changes that occur when regulations change. Thus this study is positive in nature rather than normative. It must be noted that the deregulation was not total. All commercial producers are still subject to seasonally adjusted hen quotas which are administered by the New Zealand Poultry Board. A review of the partially deregulated industry is set for 1988.

The current research aims to measure the welfare changes associated with the removal of price and marketing controls in 1986. Social costs under the controlled regime resulted from oversupply, constrained domestic consumption due to price discrimination and efficiency losses due to the production licencing system. Imports of egg products and eggs for consumption, were prohibited both for quarantine reasons, and to maintain the price discrimination policy. The partially deregulated environment has a more flexible form of production control and is characterised by egg distributor competition for regional markets. The extent of the social cost under these conditions will determine whether the current arrangements are to be transitory with a complete deregulation in the future, or permanent.

The individuals with the largest potential for welfare loss were producers so it is appropriate that this research places particular emphasis on their position. Changes in consumer welfare are also analysed, given that the aim of the deregulation was to lower costs to consumers which had become burdensome under the controlled setting. The research has been based upon partial equilibrium analysis because the egg industry is small in comparison to the national economy.

Chapter 2 describes the structure of the industry before the 1986 deregulation and reviews its regulatory history. Chapter 3 briefly describes the policy changes, and ensuing industry structure. A theoretical model of the deregulation is presented in Chapter 4. This model considers

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<sup>1</sup> See Veeman (1982) for Canada; Bureau of Agricultural Economics (1983) for Australia; Alston (1986) for State of Victoria.

the motivations for reform, and provides predictions about the effects on production location, market structure and social costs.

Analysis of the empirical evidence is carried out in Chapter 5. The short period which has elapsed since the deregulation in April, 1986 dictates a reliance on static analysis, due to data scarcity. This provides only a 'snapshot' view of the changes, and may well mask dynamic processes, given that economic events 'unfold' over time. Therefore care must be taken in drawing inferences about the effects of deregulation, from the limited data base that is currently available.

With that caveat in mind, Chapter 6 compares the results of the empirical analysis with the predictions from the theoretical model. This leads on to a discussion of policy implications and the chapter concludes with some suggestions as to the direction of future research.

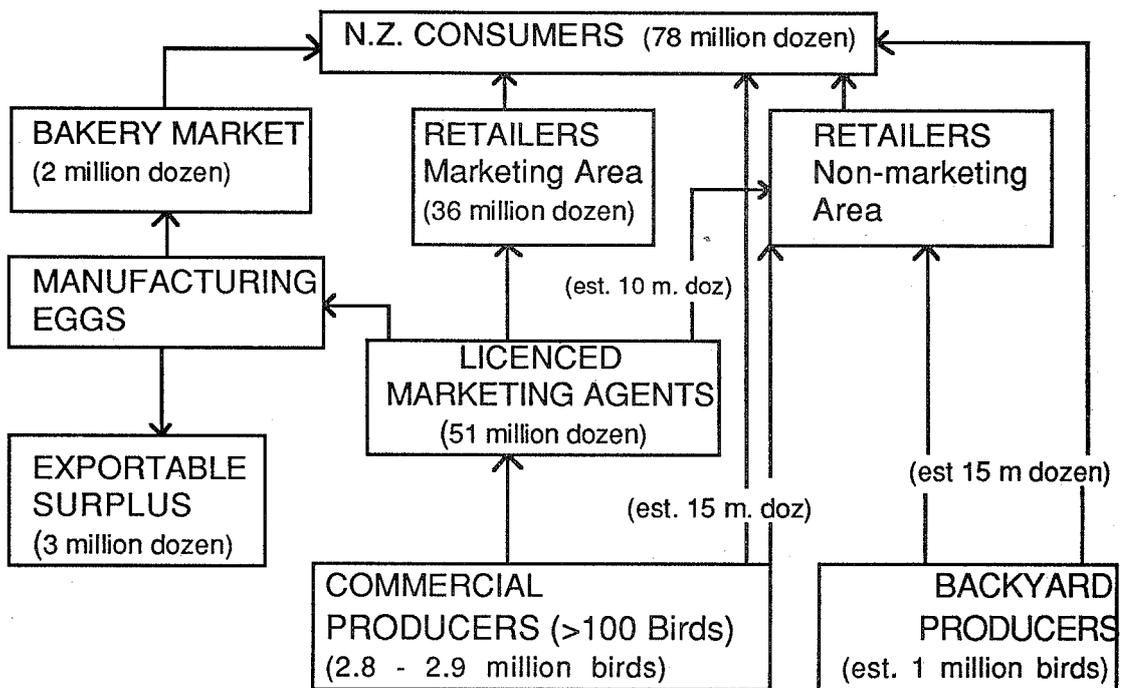
CHAPTER 2

DESCRIPTION OF THE INDUSTRY PRIOR TO DEREGULATION

2.1 Structure

At the time of deregulation there were approximately 440 commercial egg producers. The majority of these commercial farms (90.3%) had less than 15,000 birds and were run as family units (Industries Development Commission (I.D.C), 1985). All were subject to production control with quotas on their hen numbers. Figure 1 provides a schematic view of the industry, using figures presented by the Poultry Board to the I.D.C. review in 1984, and shows that most commercial production was sold to licenced marketing agents for grading, packaging and distribution to retailers. These agents operated in geographically defined marketing areas in the major population centres where they had a guaranteed market as regulations compelled retailers in these areas to purchase all eggs from them. Outside these marketing areas agents operated under licence to larger egg floors and some producers were permitted to sell to retailers. Producers in all areas were allowed to make gate sales.

Figure 1: **Structure of the New Zealand Egg Industry Prior to 1986**



Households with less than 100 hens made up an unregulated "backyard flock" which produced 20% of national output by the estimate of the New Zealand Poultry Board (1984). The large size and seasonal nature of the unregulated sector, relative to the commercial, meant that leakage effects had the potential to lower the efficacy of policy actions. Evidence of this was provided by the continuation of an egg surplus under a variety of policy instruments designed to reduce it. Even with this surplus, regional supply and demand imbalances required eggs to be moved around the country. The north and centre of the North Island consumed 53% of the commercial production but held only 48% of the entitlements (hen quotas), conversely, the South Island had a similar degree of oversupply (IDC, 1985).

The Poultry Board estimated annual domestic disappearance to be 78 million dozen. This was based on an extrapolation of personal consumption of 290 eggs/person/year which had been obtained from marketing surveys. This may be an over-estimate given that the the annual Census of Agriculture, which covers farms with 25 hens and above, found total sales for 1985 to be only 57 million dozen whereas the comparable number from Figure 1 is somewhere between 66 and 81 million dozen. Aggregate demand was relatively constant from 1973 onwards, with annual fresh egg sales by licenced marketing agents fluctuating between 44 and 46 million dozen. Commercial production levels did not exhibit a long-term trend, but were less stable, and surplus eggs were diverted into secondary markets. Most of the surplus was processed at a loss, into unpasteurised pulp for the local baking trade, and pasteurised pulp and egg powder for export. Allowance for a certain amount of this loss was incorporated into the retail price under an agreement with the Department of Trade and Industry.

## 2.2 Price Determination

Farm prices were administratively set on the basis of four-yearly surveys of the cost of production for poultry farmers. The surveys measured the price of physical factors of production, imputed wages for family labour and an allowance for a return on capital invested. The producer price was a weighted average of the production costs on various sized farms, weights being based on the farm size distribution of the commercial sector, and was updated at irregular intervals in the inter-survey period. These prices were equalised across the country and within size-based grades for all eggs, regardless of demand.

Wholesale and retail prices were derived from the farm level price, with margins set by regulation. The retail margins, with an approximate 10% markup, were much less than those found on other perishable items. Staple vegetables with a reasonably continuous supply, such as potatoes, had margins of 20% and seasonal green vegetables and fruit had markups of at least 30% (Daldoff, 1987).

In real terms the retail price of eggs fell steadily under this controlled environment. This is shown by Figure 2 which presents retail egg prices deflated by the food price index<sup>2</sup>.

### 2.3 Production Control

In the 1960's the egg industry moved from a position of shortage to one of over-production, this being due to the guaranteed returns to producers stimulating investment in productive facilities and increasing per bird productivity. From 1966 to 1969 the Poultry Board ran a voluntary contract scheme to limit this surplus production but it was circumvented by the setting up of new units under separate ownership. This led to the Egg Marketing Regulations, 1970 which set up a Production Entitlement Scheme whereby every owner of a flock over 1000 birds was required to hold an entitlement licence, these being distributed *gratis* on the basis of the number of birds then held.

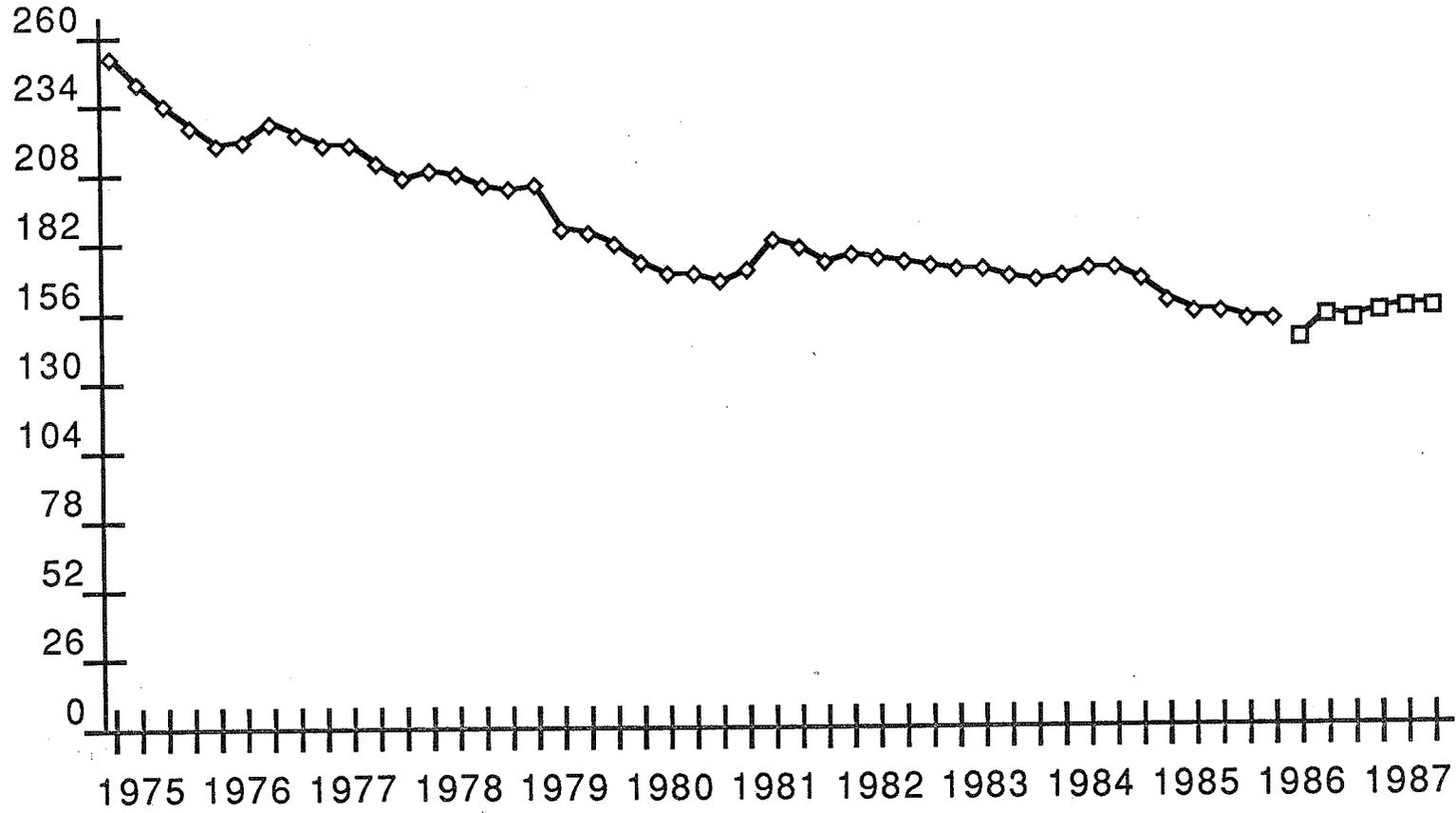
#### 2.3.1 Entitlement Levels

From the time of the entitlement scheme inception the Board found it necessary to use various mechanisms to reduce the total number of operative entitlements that producers could hold. This was due to greater per bird productivity resulting from improved management and disease control to maximise the production from the restricted factor, *viz* hens. Additionally, levies on entitlements forced producers to increase the ratio of hens farmed to entitlements held, from 77% in 1972 to 96% by 1978. There were several mandatory entitlement reductions and in 1977 the "Voluntary Incentive Scheme" (V.I.S.) was introduced with producers agreeing to reduce their flock sizes by a set amount in return for being levied at a lower rate. In 1977 the entitlement scheme was extended to flocks of between 101 and 1000 birds so the Board could exert greater control over production. In 1982 the V.I.S. was "fine tuned" by having a greater production cut during the spring and summer months when the backyard flock came into lay. The effects of these policies on entitlement numbers are indicated in Table 1.

This table also shows the impact on a 10,000 entitlement parcel (initially representing an equal number of birds) which differs from the reduction in total entitlements due to the purchase and cancellation of approximately quarter of a million licences by the Board, on top of the across-the-board cuts. The V.I.S. scheme further reduced the operative entitlements (number of hens allowed to be farmed) by 12% during the seven spring and summer months and by 6% during the remaining five months. The levy structure meant that the V.I.S. was almost universally subscribed to. All of the above

<sup>2</sup> This deflator is theoretically incorrect, due to the fact that egg prices are a component, however they only contribute 2.1% so the error should not be significant.

PRICE  
cents/doz  
(1983)



◇ Controlled Price    □ Free Price

production cuts were applied to egg-deficit as well as egg-surplus areas. The Poultry Board explained this as the collective desire of producers to maintain a share of the New Zealand market, equivalent to that which they had at the onset of the entitlement scheme.

Table 1: **Changes in Entitlement Levels 1970- 1987**

	Total Entitlements <sup>a</sup>	% of Original	Effect on parcel of 10,000 <sup>b</sup>
1/1/71	4.805 million	100%	10000
1/2/75	4.024 million	84%	8500
1/4/76	4.142 million	86%	8750
1/8/77	3.840 million	80%	8000
1/6/83	3.240 million	67%	7200
31/3/86	3.006 million	63%	6696

<sup>a</sup> Adjusted to include 101-1000 bird units prior to 1977

<sup>b</sup> Assuming the owner did not increase entitlement by off-farm buying.

### 2.3.2 Entitlement Transferability

When the scheme was first introduced there was free private trading in entitlements subject to a maximum holding of 20,000 licences (except for producers who had a greater number at the start of the scheme). Equalised pricing meant that producers at locations distant from the market were having their transport costs subsidised by producers closer to the market, and by consumers. Given that other costs were not equal, the remote producer was often in an advantageous position and could afford to pay more for entitlements. This distorted pricing led to the Board introducing 'controlled transferability' in 1973, prohibiting entitlement transfers from shortage to surplus production areas.

In 1976 the Board became concerned that entitlements were being traded at over \$4 per bird licence, NZPB (1976) and in an attempt to dampen excess demand, introduced a moratorium on transfers for two separate periods. The cause of the excess demand for entitlements, an above equilibrium egg price leading to supernormal profit, was not affected by this moratorium and the entitlement purchase price continued to rise (NZPB, 1977). The Board became sole buyer of entitlements sold separate from farm assets ('off-farm' transfers) on August 1, 1978 after asking the government to regulate in this direction. The delay between the announcement and implementation of the policy change saw producers buying entitlements at an increased rate, to get

themselves to a desired bird holding, which exacerbated the excess demand. Table 2 shows that in the month previous to the implementation of these regulations, approximately 44,000 licences were traded. Over the next two years the Board paid a price of up to \$5 per licence and only 65,022 licences were purchased and revoked. This provides some indication that the Board buying price was less attractive than the market prices in the prior period of excess demand.

Table 2: **Transfer Data for Entitlements Sold 'Off-Farm'**

Year	Price	Number of licences traded
- 30/6/72	Negotiable	264,707
- 30/6/73	Negotiable	376,749
- 30/6/74	Negotiable	326,802
- 30/6/75	Negotiable	215,406
- 30/6/76	Negotiable	220,583
- 30/6/77	Negotiable/Moratorium imposed	251,998
- 30/6/78	Negotiable/Moratorium imposed	203,202
1/7/78 - 31/7/78	Negotiable	43,696
1/8/78 - 31/7/80	Board sole buyer @\$5 maximum <sup>a</sup>	65,022
1/8/80 - 31/7/81	Board sole buyer @\$5 each <sup>a</sup>	219,668
1/8/81 - 31/7/82	Board sole buyer @\$2.50 each <sup>a</sup>	4,102
1/8/82 - 31/3/86	Board sole buyer @Nil value <sup>a</sup>	Nil
1/4/86 - 30/6/86	Negotiable	291,882
- 30/6/87	Negotiable	156,000 <sup>b</sup>

<sup>a</sup> Set by regulation

<sup>b</sup> Provisional

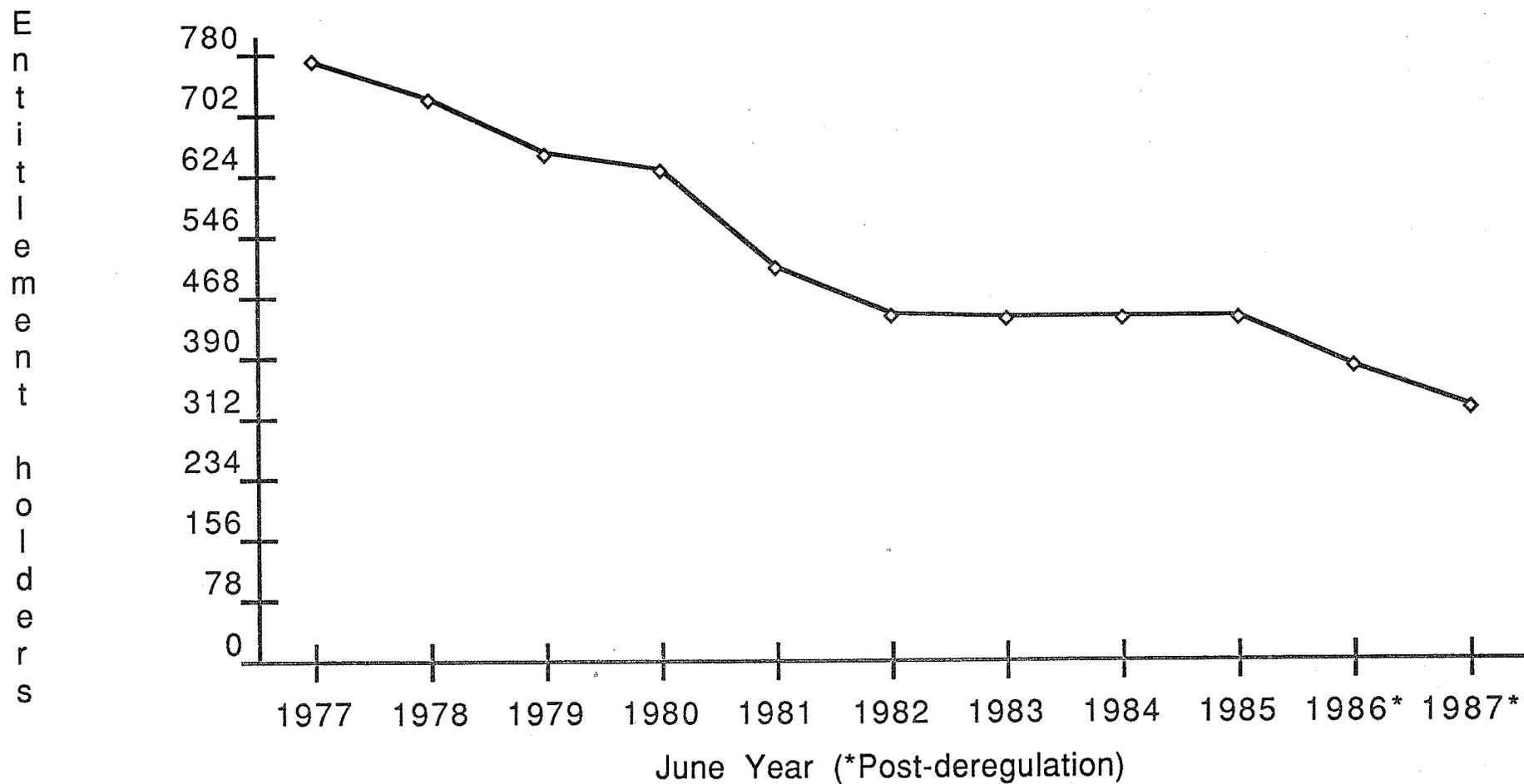
The sole buyer status of the Board was continued under the 1980 Regulations with the purchase price being set at \$5 per licence until July 31, 1981; then \$2.50 for the next 12 months, after which licences were to have nil value. It was still possible under the non-transferability of licences for producers to expand by buying a going concern and after two years they could amalgamate their entitlement holdings. By preventing the off-farm transfer of entitlements, production was maintained in areas which did not correspond to market location. In contrast the period of transferability from 1972 to 1978 had brought about a significant relocation of the national flock with 5% of all licences (and hens) moving from the South Island to North Island resulting in more balanced regional supplies and demands.

#### 2.4 Changes in Producer Numbers

Production in the commercial sector has become increasingly concentrated in the hands of fewer producers. The average annual rate of decline in producer numbers was 7% over the period 1972 to 1986. Figure 3 which graphs the number of entitlement holders from 1977 onwards (when flocks of over 100 birds were included in the scheme) shows two significant deviations from this downward trend. These were 1979 to 1981 when the Board was sole buyer of entitlements and the price was to be reduced to \$2.50 per licence after that period; and from 1982 to 1985 when the price for entitlements sold off farm was administratively set at zero. The rate of decline in entitlement holders was zero during the period of the nil-value policy for entitlements sales. The number of active producers may have declined during this period as some entitlement holdings were not being used. Producers recognised that this low rate of exit contributed to excess capacity, necessitating larger production cuts for all, and lobbied government for a return to entitlement transferability (NZPB, 1984).

Figure 3:

Changes in Entitlement Holder Numbers (1977-1987)



## CHAPTER 3

### THE 1986 DEREGULATION

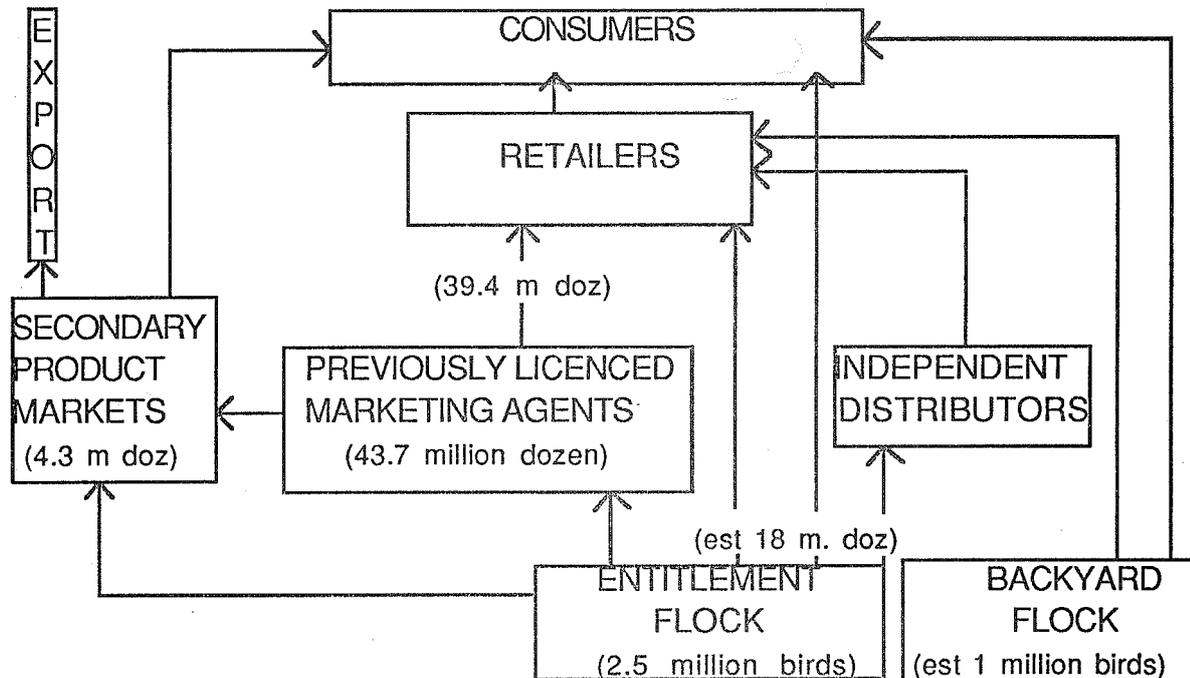
#### 3.1 Description

On April 1, 1986 the following policy changes were made:

1. All controls over the marketing and pricing of eggs were abolished.
2. Regulations dealing with grade definitions were rescinded (although eggs were still subject to minimum quality standards under Section 131 of the 1984 Food Regulations).
3. Import controls on egg products were revoked but quarantine controls remained on imports of fresh eggs for consumption.
4. Production control remained but the maximum entitlement holding limit (previously 20,000) was abolished and entitlements became freely transferable.

Figure 4 provides a schematic view of the resulting industry structure, with quantities (where known) for the year to June, 1987. Relative to Figure 1 there was still a dualistic production sector, comprising the entitlement flock on commercial farms and the unregulated backyard flock. However the abolition of marketing areas meant that producers were free to sell via any outlet. These new marketing options caused a significant decline in the number of eggs handled by previously licenced marketing agents, as independent distributors (who were usually producers) became established.

Figure 4: Structure of the New Zealand Egg Industry After Deregulation



### 3.2 Background

The egg industry deregulation was set within a context of an increasing liberalisation of the New Zealand economy that aimed to improve the overall efficiency of resource allocation. The major items of this program were industry studies that started in 1979, and included tobacco, milk, fruit and eggs; as well as deregulation of the meat, transport and wheat industries and a general freeing up of trade restrictions and currency controls. The recommendations of the 1984 I.D.C review of the industry formed the basis of the 1986 deregulation. The major difference being that the I.D.C. had recommended that the entitlement scheme be abolished after a transition period, whereas the government announced only that it would be reviewed.

Further impetus for the deregulation came from the Treasury who suggested that the controls then in place "led to a very inefficient industry structure and use of resources"<sup>3</sup> Public statements by the Ministers of Trade and Industry, and, Agriculture and Fisheries indicated that the motivation for the reform was to achieve lower prices for consumers<sup>4</sup> This was a common motive in all of the deregulations, and involved reducing producer control over the marketing process so that the power distribution between producers and buyers was not artificially distorted.

<sup>3</sup> The Treasury (1984) *Economic Management: Land Use Issues* p. 86.

<sup>4</sup> Press Statement, 10 October, 1985.

## CHAPTER 4

### THEORETICAL MODEL OF THE POLICY CHANGE

#### 4.1 Motivation For Reform

It has been suggested that government regulation of economic activity gives rise to various forms of rent (Buchanan, 1980). These rents are above opportunity cost payments to resources, due to artificial restriction of supply resulting from administratively set standards governing price, quantity or quality (Benson, 1984). Traditionally an increase in the surplus accruing to producers as a result of monopoly actions has been viewed as a welfare transfer from consumers to producers. The social cost in this case is the deadweight loss triangle<sup>5</sup> caused by under-consumption. Recently, a 'rent-seeking' proposition has been put forward in which producers are assumed to compete for these artificially created transfers. The opportunity cost of resources expended in competition for these rents is also seen to be a social cost (Posner, 1975).

These rents can only be maintained if there are barriers to free entry by potential firms. In a competitive industry subject to production control, second generation participants do not enter for free because they have to pay some licence fee to gain a share of the rent stream. As a result, there are only transitional gains to be made when government establishes special privileges for a group of people (Tullock, 1980). Additionally, a view has emerged that the granting of assistance or special privileges to one activity or group can only be achieved by penalising others (Treasury, 1984a). If transactions costs are not too high the disadvantaged group will lobby to alter the distribution of gains in their favour. This may lead to the "marginal adjustment trap" (Jones and Thompson, 1984), where more regulation is needed to overcome the distortions which arose from the original intervention. Given this situation, governments have perceived a comprehensive reduction of intervention to be desirable.

However the great divergence between the general desirability of deregulation and the actual progress towards this goal, indicates that it is not a smooth process. It is suggested that in cases where government has no direct financial involvement in an industry, and there will only be diffused gains, but concentrated losses from a reform of economic regulation, efforts to promote reform will normally

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<sup>5</sup> See Harberger (1954) for a discussion of welfare loss resulting from resource misallocation due to monopoly.

fail (Lee and Orr, 1980). Failure of reform in such situations is due to the fact that the potential losers have a much greater incentive to organise and lobby government than do the potential gainers. This view of government holds that economic intervention and reform is a function of interest group pressure.

The egg industry fulfilled all of these requirements; with direct government involvement ending in 1976 when consumer subsidies were abolished, a small number of gainers from the regulated environment in the form of producers and distributors and a large number of individual consumers each making a small loss. The fact that reform did proceed in such circumstances is contrary to the interest group theory of government. However some recognition must be made of the reviewing agency itself as a stimulus for reform. It appears that the egg industry was subjected to an I.D.C. review, rather than undergo self-reform as agreed to by the Undersecretary to the Minister of Agriculture in December 1983, partly because the I.D.C. was running out of 'candidates' in it's industry restructuring program.

The egg industry deregulation was a part of a general policy of economic liberalisation which began in 1979 with 'industry plans' for several agricultural and manufacturing sectors. The stimulus for this restructuring of the economy came from the poor growth rate experienced by New Zealand relative to other developed countries, a high inflation rate and a chronic balance of payments deficit. The industries subjected to review, and the sequencing of reviews, were not necessarily related to the degree of resource misallocation. Other influences were the strategic importance of the industry and the employment effects of restructuring. Additionally, a reduction in the political strength of farm lobbies meant that maintenance of farm incomes was a less important policy goal than improved economic efficiency.

The scope of reform may also be limited by transitional costs, which are greatest in the cases where deregulation is potentially most beneficial, because structural adjustment costs are proportionate to the divergence from competitive optimum. The general economic restructuring which took place in New Zealand should have acted to lower the transition costs of industry reform. The flow-on effects of decontrol were expected to lower the costs of subsequent industry restructuring, and the widespread incidence of economic pain might have made it easier for government to resist specific lobbying pressures by pointing to the disadvantaged positions of other sectors in the economy.

#### 4.2 Entitlement Values and Movements

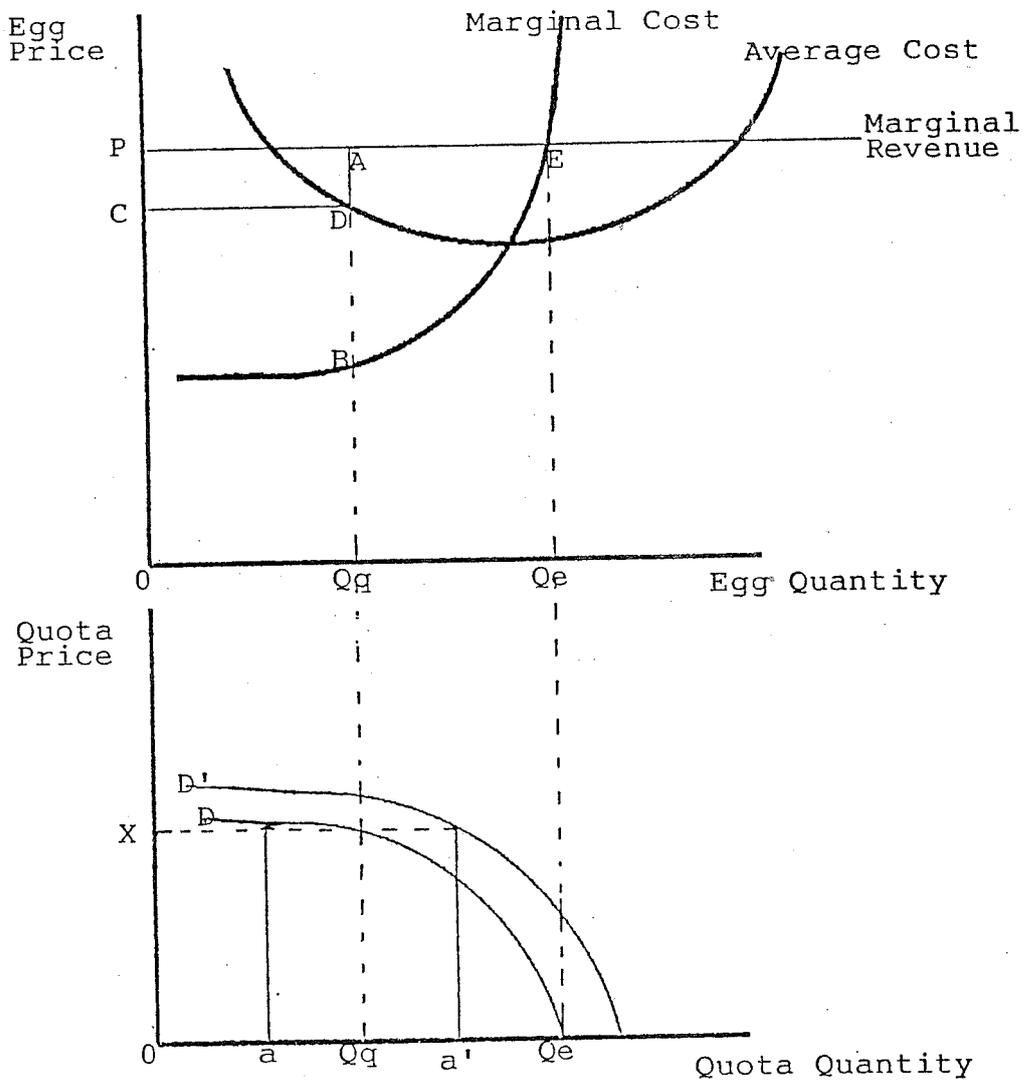
The purchase price for a quota in a competitive market is it's marginal value, which is the difference between the marginal revenue and marginal cost of production at the point where the quota is binding (Butcher and Heady, 1963). If the

quota has a life of more than one year (as entitlements did) then the purchase price should be the discounted sum of expected future benefits. The producer's discount rate, time planning horizon and the expected salvage value of quota reflect individual expectations about the maintenance of the supply restricting program in the future.

The general situation faced by an individual firm constrained by a quota (on either inputs or output) is shown by Figure 5. The marginal benefit of additional licences at the point where quota is binding, is the distance AB, the difference between marginal revenue and marginal cost. The optimal situation for the firm is point E, the profit maximisation point, at output level  $Q_e$ . The firm's demand curve for quota can be derived as the distance between marginal cost and marginal revenue as output increases to point E. The quota purchase price for someone wanting to buy an existing unit is area PADC, as this is the value of the rent associated with output  $0Q_q$  (Barrichello, 1982). Those firms faced with higher marginal revenues and/or lower marginal costs, will have a higher demand for quota over all values. Even if two firms are faced with the same MR and MC curves, the firm with the lower discount rate and/or longer time horizon would be willing to pay more for quota.

The supply curve for quota is the difference between MR and MC to the left of  $Q_q$ , as it would be rational to sell currently held quota if the offer price was higher than the marginal benefit of those quota units (Arcus, 1978). A situation of potential trade in quota is shown in part B of Figure 5. The firm with the higher demand for quota has demand schedule  $D'$ , and at prices above  $P_x$  firm D sells quota to firm  $D'$ . In a perfect market quotas would be traded until the marginal benefit of holding licences was equal for all holders, with production concentrated in the hands of producers, who by virtue of their efficiency and location, had the lowest costs (Beck, *et al.*, 1984). The costs of quota purchase represent the necessary 'bribe' for inefficient and/or poorly located producers to leave the industry, and are borne by the remaining producers, who are still made better off by trade, with the producers surplus being shared amongst fewer of them (Lane and MacGregor, 1979).

Figure 5: The Derived Demand For Quota



#### 4.3 Market Structure

It is believed that producer co-operatives formed to raise prices in competitive industries will exhibit unstable tendencies, (Lipsey, 1983). It will always be in the interest of any single member firm to raise it's output but if many firms do so the co-operative will collapse and all firms will lose. The punitive levies against non co-operators in the entitlement and V.I.S. schemes, both before and after the 1986 deregulation, ensured the survival of the compulsory cartel for all commercial egg producers. Piggott (1981) has shown that for commodities with low demand elasticities, where non co-operators were of equal, or larger size than co-operators, the greatest gains from voluntary supply restriction accrued to non co-operators. Theory would suggest that the 1986 marketing control removal would prevent pricing above the level dictated by the overall supply restriction within the entitlement scheme. Attempts at regional price discrimination and/or supply limitation would break down in the long run due to the presence of non co-operators.

#### 4.4 Social Costs

Analysis of social costs in this study is based upon movement away from the competitive equilibrium as a result of market distortions. It is assumed that the area under the demand curve and above the equilibrium price is a measure of consumer surplus (Beck, 1974). The supply curve represents the opportunity costs of variable resources used in production of a commodity, so any area above the supply curve and below the price is considered producers surplus (Wallace, 1962). The social costs of above equilibrium prices are domestic consumption foregone and the excess of resource costs over returns for any surplus production. Input quotas cause social costs due to a structural shift in, as well as along the supply function resulting in marginal revenue being greater than marginal cost (Alston, 1981).

Wallace (1962) first established that input controls cause greater social costs of supply shift than output quotas, due to an over-use of non-limited inputs in an attempt to maintain production at pre-quota levels. This leads to a situation of 'slippage' where a less than proportionate reduction in output results from input restrictions. In Western Australia the introduction of hen quotas in 1971 led to a 9.5% per bird productivity increase as a result of this more intensive use of other factors (Beck, 1974). The other social costs of input quotas are due to their imperfect allocation and non-costless transfer, as well as the fact that producers desire a return on quota they hold.

Positive quota values involve a transfer of wealth from consumers to producers (Johnson, Spriggs and Van Kooten, 1982). The economic rent associated with quota ownership should not all be attributed to the social cost of supply restriction as it includes some quasi-rents, to factors such

as land, which would exist without production control (Veeman, 1982). It was found by Alston (1986) that the consumer transfer to producers, as a result of production control in the Victorian egg industry was between 12 and 21 cents (NZ, 1987) per dozen. The Bureau of Agricultural Economics (BAE, 1983) found a 'most likely' estimate of the consumer transfer to be 41.5 cents per dozen for a study of the Australian industry, although it appears that a mis-specification of the supply function was involved, which biased estimates upwards (Alston, 1986). In Canada, Veeman (1982) found a range of values for the consumer cost of supply control from 6 to 24 cents/dozen.

The 1986 deregulation of the New Zealand egg industry should have reduced social costs by reducing overproduction to the level necessary to just cover wastage (which would also occur in a free market) and lowering the efficiency losses of production control. This can be seen by comparing Figure 6, which presents a geometric model of the egg market prior to April 1986; with Figure 7 which presents a post-deregulation model. In Figure 6,  $D_f$  represents the farm level demand for eggs within marketing areas.  $P_n$  is the gross producer payout price, and  $P_s$  is the average return on the secondary egg markets (dried and pulped eggs and shell egg exports), including the sales to the domestic baking trade made at a loss prior to July 1, 1984.  $Q_d$  is the quantity of fresh eggs demanded within the marketing areas at the administered price (the farm price plus set margins for wholesalers and retailers).  $Q_n$  is the total production within the fully controlled sector, i.e. commercial production that went to licenced marketing agents.

The guaranteed price to producers  $P_n$  was above the marginal price  $P_s$ , leading to overproduction of quantity  $Q_n - Q_d$ . The entitlement scheme was instituted to limit the size of this surplus and had the effect of shifting the supply curve from  $S_1$  to  $S_2$ . Debate exists in the literature as to whether quotas shift a supply curve to the left due to inefficient allocation (Alston, 1981; Veeman, 1982) or to the right due to a reduction in uncertainty for producers (Johnson, Spriggs and Van Kooten, 1982). In the case of the egg industry there is reason to suspect a leftward shift due to three factors. Firstly, the limitation on individual entitlement holdings prevented the capture of economies of size which may exist for holdings as large as 250,000 hens (Alston, 1981). Secondly the restrictions on transferability resulted in non-optimal production locations. Finally, entitlements had a positive value, the so-called "goodwill" which was capitalised into average (and marginal) costs, shifting the supply function upwards. It is assumed that the movement from  $S_1$  to  $S_2$  is a pivotal shift because the effects of suboptimal location and size limitations would have a larger absolute effect at higher outputs, causing  $S_2$  to move further from the free supply schedule.

Figure 6: Social Costs of Supply Restriction and Price Control

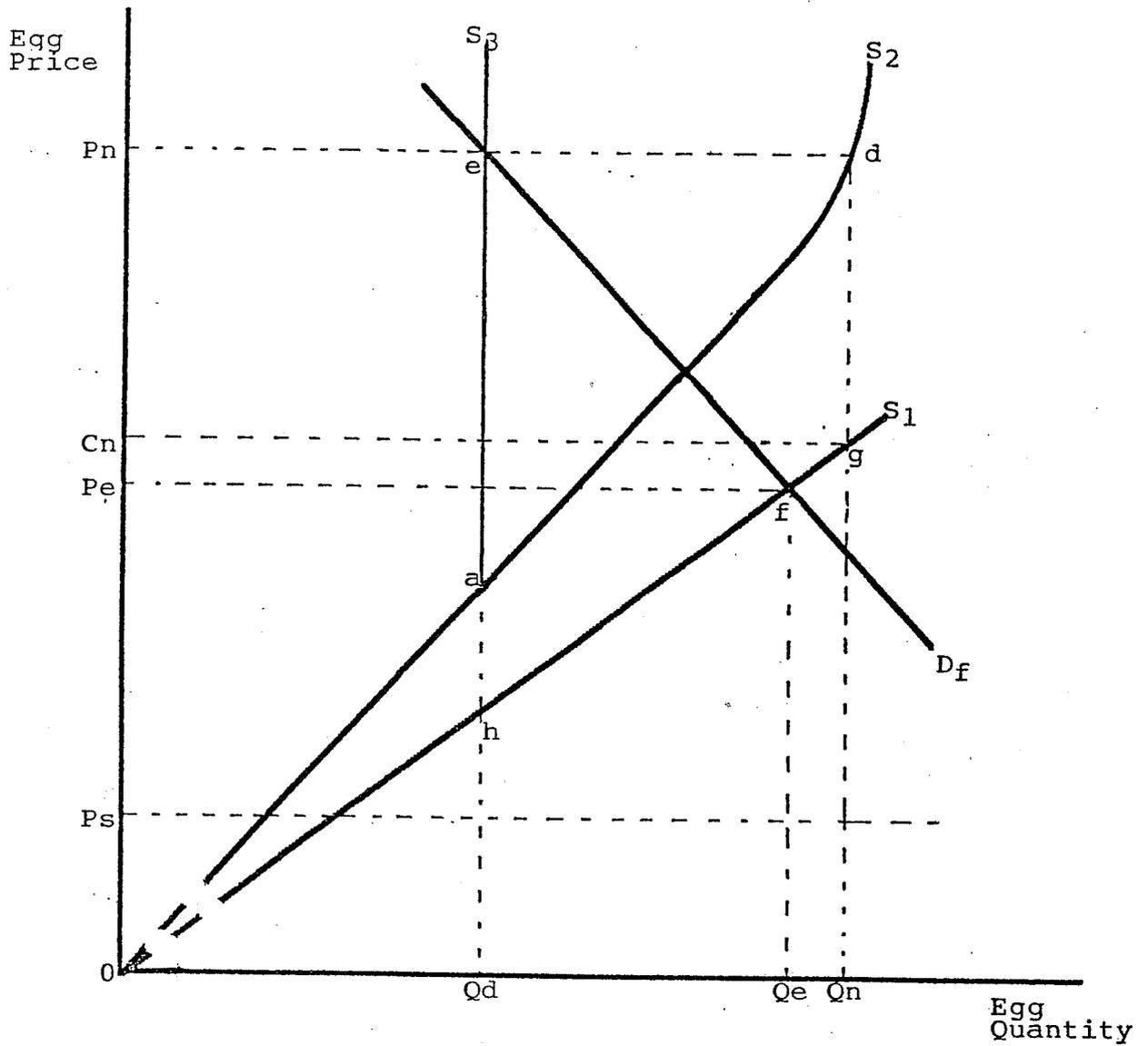
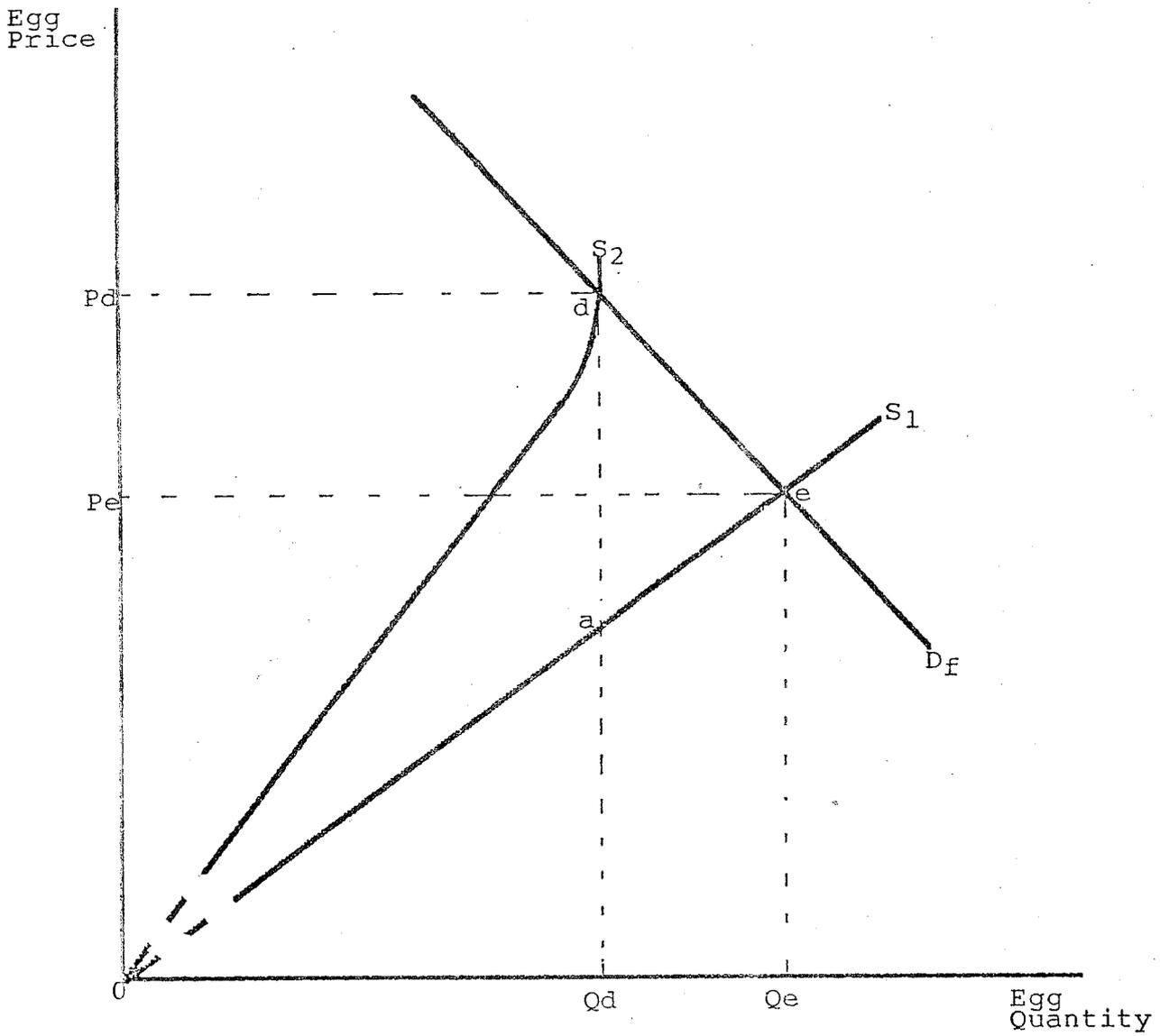


Figure 7: Social Costs of Production Control



For the period prior to deregulation the changes from the self sufficiency point  $P_e$ ,  $Q_e$  were as follows: producer surplus was increased by area  $OdPn - OfPe$ ; consumer surplus was reduced by area  $Pn efPe$ ; and the social cost was the sum of two areas; cost due to the supply shift, area  $Ogd$ ; and the cost of oversupply  $Qd hgQn - ((Qn-Qd)*Ps)$ . The second area measures the social opportunity cost of resources used to produce the surplus eggs so it is appropriate to use the free supply curve  $S_1$  rather than  $S_2$  which is the supply curve including rent (payment above opportunity cost) intrinsic to egg production.

In Figure 7, there is no social cost due to oversupply as it is assumed that the removal of administered pricing and marketing controls eliminates excess supply. This being due to the presence of non co-operators forcing the farm price,  $P_d$  down to the level which results from the intersection of farm level demand,  $D_f$  and the controlled supply,  $S_2$ . This is somewhat of an over-simplification as some surplus would be necessary, to cover inter-temporal and inter-regional demand variations, given that the possibility of storage does not exist. Social costs in such a situation are  $Ode$ , being due to the shift in supply which would result from the continuation of the entitlement scheme.

In both Figure 6 and Figure 7, the use of an input quota is shown to cause an upwardly sloping curved supply schedule from the point where the quota becomes binding. This curvature depends on the marginal rate of factor substitution between the limited, and non-limited inputs, and is absent in cases where the rate of substitution is zero. In Figure 6 the social cost of an output quota for quantity  $Q_d$  would be area  $Oaef$ . The difference between the social cost, and producers and consumers surplus in the two models is taken to be that which can be attributed to the effects of the 1986 deregulation.



## CHAPTER 5

### EMPIRICAL ANALYSIS

#### 5.1 Producer Adjustment

The years prior to the reform were characterised by an excess egg producing capacity, meaning that many resources were earning suboptimal returns. It was expected that a total deregulation of the egg industry would cause rapid structural adjustment (I.D.C., 1985). The partial nature of the 1986 deregulation, with the continuation of the entitlement scheme, maintained substantial entry barriers which provided incumbent producers with some insulation from competition. The reaction of producers, in making decisions about whether to leave the industry or to expand production, provides important information about individual perceptions of the policy changes. The review of the entitlement scheme set for 1988 created uncertainty which could be expected to affect the degree to which individual producers committed themselves to making adjustments in their enterprises.

##### 5.1.1 Producer Numbers

The theoretical model suggests that a return to free entitlement trading would facilitate the movement of high cost producers out of the industry. At the time of deregulation there were 438 entitlement holders, this number had declined to 333 after 12 months. This 24% decline is illustrated by Figure 3 and can be compared with the average rate of decline of 7% over the period 1972 to 1986. It would appear from this analysis that the reintroduction of entitlement trading speeded up the rate of industry adjustment. Hunter (1981) concluded that the initial introduction of hen quotas in Australia had a similar effect.

The movement away from administratively set and equalised prices may not have provided producers with more information about market conditions due to the continuation of production control. This is because the price of eggs, relative to other goods, would not reflect true supply and demand conditions but rather the impact of the entitlement scheme. Decisions by firms about remaining in the egg production sector, or changing to other activities could thus be influenced. To test this proposition, a model was built to explain the number of entitlement holders in any one year. It was hypothesised that the explanatory variables were the real producer payout price and the real cost of inputs, giving the two components of the "cost-price squeeze". For the period 1977 to 1987 the following equation was estimated with ordinary least squares (OLS) regression.

$$N = -252.2 + 12.677 P - 0.164 RPPI \quad (1)$$

\*\*\*
\*\*

(1.28)
(8.95)
(2.55)
\*\*\*

[2.81]
[-1.27]
F(2,8) = 50.42

$R^2 = 0.93$   
 Durbin Watson  
 statistic = 2.10

where

() = t statistic  
 [] = Elasticity  
 \*\*\* = Significant at 1% level  
 \*\* = Significant at 5% level  
 N = number of entitlement holders  
 P = producer payout, deflated by the CPI (12/83 = 1000)  
 RPPI = feed component of the "all-farming" input price index, also deflated by the CPI

This equation confirms the *a priori* expectation that the number of egg producers was inversely related to the cost of inputs and positively related to the farm level egg return. The producer price had the largest effect as shown by its higher absolute elasticity.

The explanatory variables and the equation as a whole were all statistically significant and there was no evidence of a violation of the OLS assumptions. A form of the Chow test for differences between two sets of regression coefficients was used to test if the deregulation produced a structural break in the explanatory relationship. This test was chosen because there were only two observations available for the deregulated period. The sums of squared residuals were computed for the periods 1977 to 1985 and 1977 to 1987 to give the following test statistic:

$$\frac{(SSR_{1+2} - SSR_1) / N_2}{SSR_1 / (N_1 - k)} \sim F(N_2, N_1 - k)$$

where  $N_1$  was the number of observations in subperiod I (1977 to 1985),  $N_2$  the number of observations in period II and  $k$  the number of coefficient estimates in the equation.  $SSR_{1+2}$  and  $SSR_1$  are the sums of squared residuals, from the model estimated over the entire period, and from the regression on subperiod I, respectively. The computed value of  $F(2,6) = 2.0$  did not exceed the critical value so it was concluded that deregulation did not alter the relationship between entitlement holder numbers and input and output prices.

The economic implication of this lack of a structural break with deregulation, is that the removal of price and marketing controls did not alter the influence of prices on exit decisions. This may have been due to the continuation of barriers to entry in the form of the cost of entitlement purchase for new entrants. On the other hand factors such as

producer age structure and expectations, opportunity costs of productive resources and policy changes and uncertainty also influence exit decisions by firms.

### 5.1.2 Producers Time Horizons

Entitlement purchase decisions were functions of the adjustment to the partially deregulated environment and expectations about the future course of the deregulation. If entitlement purchase prices were not recouped by the time of their abolition the current holders would suffer considerable windfall losses, although there would be some gain in reaching a target hen number earlier than those who waited for the potential abolition of the scheme before expanding.

Hen quota selling prices ranged from \$6 to \$15 per bird licence during the first 12 months of deregulation, \$8 to \$12 during the next 6 months and \$6 to \$8 after that (Mitchell, 1987). By farming birds below the leviage age, with a production level of 265 eggs/hen housed, it is quite possible to annually produce 21.5 dozen eggs per base entitlement (see Appendix B). If there was an expectation of recouping entitlement purchase costs before the 1988 industry review the above trading prices imply a quota rent (for production in a licenced industry) of between 14 and 35 cents per dozen, making no allowance for a discount rate (which would increase the rent estimate). Alternatively, using the entitlement values, and estimates of the marginal benefit of additional quota, it was possible to estimate producers planning horizon. This assumed the purchase price for entitlements was the discounted sum of expected future benefits.

The marginal value of entitlements was estimated from a representative budget for a 20,000 bird unit, constrained by entitlement cuts to a base entitlement holding of 16740 (see Appendix B). A movement to the full capacity point would be desirable, lowering fixed costs per base entitlement from \$7.60 to \$6.15. The variable costs per entitlement were constant, or possibly declining with improved labour productivity as entitlement numbers increased, and hence provide an estimate of the marginal cost of extra entitlements. The output price for an individual producer was assumed to be independent of quantity, so returns above variable cost provided a good measure of the marginal benefit of extra entitlements, up to the full capacity output.

For the first 12 months of deregulation the budget showed returns above variable cost per entitlement to be \$7.67 and in the second year \$8.45 due to lower levies and a higher producer payout. It was assumed that producers had an expectation of zero salvage value for any purchased entitlements due to the low volume of reselling of bought entitlements, and the potential demise of the scheme in 1988. Egg payouts are made on a fortnightly basis and levies collected on a monthly basis so the correct discounting period is monthly (Arcus, 1978). The discount rate should be in real

terms to account for costs and revenues in different time periods. Two rates were used: a low value of 0.5%/month (6.2% annually) and a higher value of 1%/month (12.7% annually) to reflect uncertainty about the future of entitlements. Three entitlement purchase prices, all within the commonly quoted range were used: \$8, \$11 and \$14 per licence. The implicit time horizons, for purchases on April 1 1986 and April 1 1987, are listed in Table 3.

Table 3: **Producers Time Horizon (months) at April 1, 1986 and April 1, 1987**

Date	Discount Rate	-----Purchase Price-----		
		\$8	\$11	\$14
1/4/86	0.005	13	18	24
	0.01	14	19	26
1/4/87	0.005	12	17	22
	0.01	13	18	23

Table 3 shows that the prices paid for entitlements were based upon a payback period of 26 months or less. The majority of entitlement sales took place in the first two months of deregulation which would give enough time for purchased entitlements to pay for themselves before the 1988 review of the industry. The time horizons in Table 3 indicate that producers adapted their planning horizon very rapidly to the length of the partial deregulation period. If the entitlement scheme was abolished in 1988 there would only be a few windfall losers amongst entitlement purchasers.

### 5.1.3 Producer Survey

Interviews were conducted with ten Canterbury producers (21% of total) in August, 1987 to supplement the analysis of farm level adjustment (see Table 4). The producers held approximately 35% of the regions birds, indicating a bias towards larger farms. Four of the ten had purchased entitlements, one planned on selling his entitlements, and three were marketing outside of the co-operative (CCD) egg floor. None of the non co-operating (independent) producers had purchased entitlements. All producers showed a very consistent age and most had been in the industry for 20 years and/or were second generation producers. It was generally agreed that this age structure was a reason for their remaining in the industry, being too young to retire but too old to begin a new occupation.

Table 4: **Producer Interview Responses**

	Affirmative Answers	
	Co-op Suppliers	Independents
Would you purchase entitlements now?	2	0
Expect entitlement scheme to be scrapped?	3	3
Support total deregulation	0	3
Contemplate becoming an independent	2	n/a
<b>Why did you leave the Co-op?</b>	n/a	
CCD production cuts		2
Desire to establish market position before full deregulation		3
<b>Major Concerns</b>		
Lack of grading by independents	5	0
Christchurch market volatility	2	3
'Predatory'(sic) pricing by the Co-op	0	3
Downgrading problems with Co-op	2	2
Windfall losses if entitlements scrapped	4	0
Overproduction if entitlements scrapped	6	0
Uncertainty about 1988 review	3	3

The producer interviews confirmed the rapid adaptation of planning horizons as only two producers were prepared to risk buying entitlements with the 1988 review coming up, and neither of them would pay more than \$7/licence. Just over half of the producers interviewed expected the entitlement scheme to be scrapped, with all three of the independents lobbying actively for that goal. The major concerns of the co-operative producers were the lack of grading by the independents, feeling that they were free riding upon the previous market reputation of graded eggs, and the potential for overproduction if entitlements were scrapped. The major concerns that the independent producers felt were market volatility due to retaliatory pricing by CCD on mixed grade eggs in the Christchurch market. The major reason for leaving the co-operative was a desire to establish a market position before complete deregulation. This also indicated an expectation that the entitlement scheme would be abolished.

## 5.2 Entitlement Movements

Three months after the deregulation, the Chairman of the Poultry Board reported disappointment that there had been little movement of entitlements from surplus producing areas to egg deficit areas (Briggs, 1987). The theoretical model predicted that free transferability and non-intervention pricing, to reflect true regional profit relativities, would lead to entitlements moving towards cost-minimising locations. The Board had previously commissioned a Lincoln College study on the optimal location of egg production in New Zealand (Beck, *et al.*, 1984) which had been based on an objective function of reducing aggregate production costs (including inter-regional egg transfers). This objective function would

be minimised in a competitive market if there were no adjustment costs and full information.

Although it used 1983 data, the study still provided a useful standard for comparison with the actual regional changes. This comparison is provided in Figure 8, however, it should be noted that the regional definitions do not always correspond with egg floor supply areas. The most obvious divergences between the recommended movements and actual changes were in Wellington, which was an egg-deficit area from which entitlements moved out of, and Tauranga and Christchurch, in both of which it was recommended substantial output reductions be made. The only areas to gain major increases in entitlements were Auckland and Whangerei with the largest losses recorded in Oamaru, Nelson, Wellington, Hastings and Gisborne.

A correlation analysis was carried out to test the statistical relationship between the Lincoln College recommendation and the actual movements after 12 and 18 months of entitlement transferability (see Appendix C for data and transformations). The resulting correlation coefficients were 0.316 and 0.339, respectively, with the 18 month correlation being significantly different from zero at the 90% level (with 16 degrees of freedom). It was inferred from this that entitlement transferability led to some relocation of production, and this appeared to be converging towards the optimal location, as recommended by Beck, *et al.* There remained, however, significant regional variations in adjustment towards the recommended levels.

### 5.2.1 Explanatory Model

An economic model of entitlement transfers was formulated to investigate divergences between the actual changes and what had been recommended. It was hypothesised that the inter-regional movement of entitlements was generated by different regional demand curves. Within the egg industry, the minimum point of the short run average cost curve occurs at the level of full utilisation of existing sheds. At higher outputs the average and marginal costs rise sharply. The reductions in entitlements had meant that most producers were operating at between 70% and 80% of full capacity. The value of additional entitlements was greatest for large producers who had lower average and marginal costs.

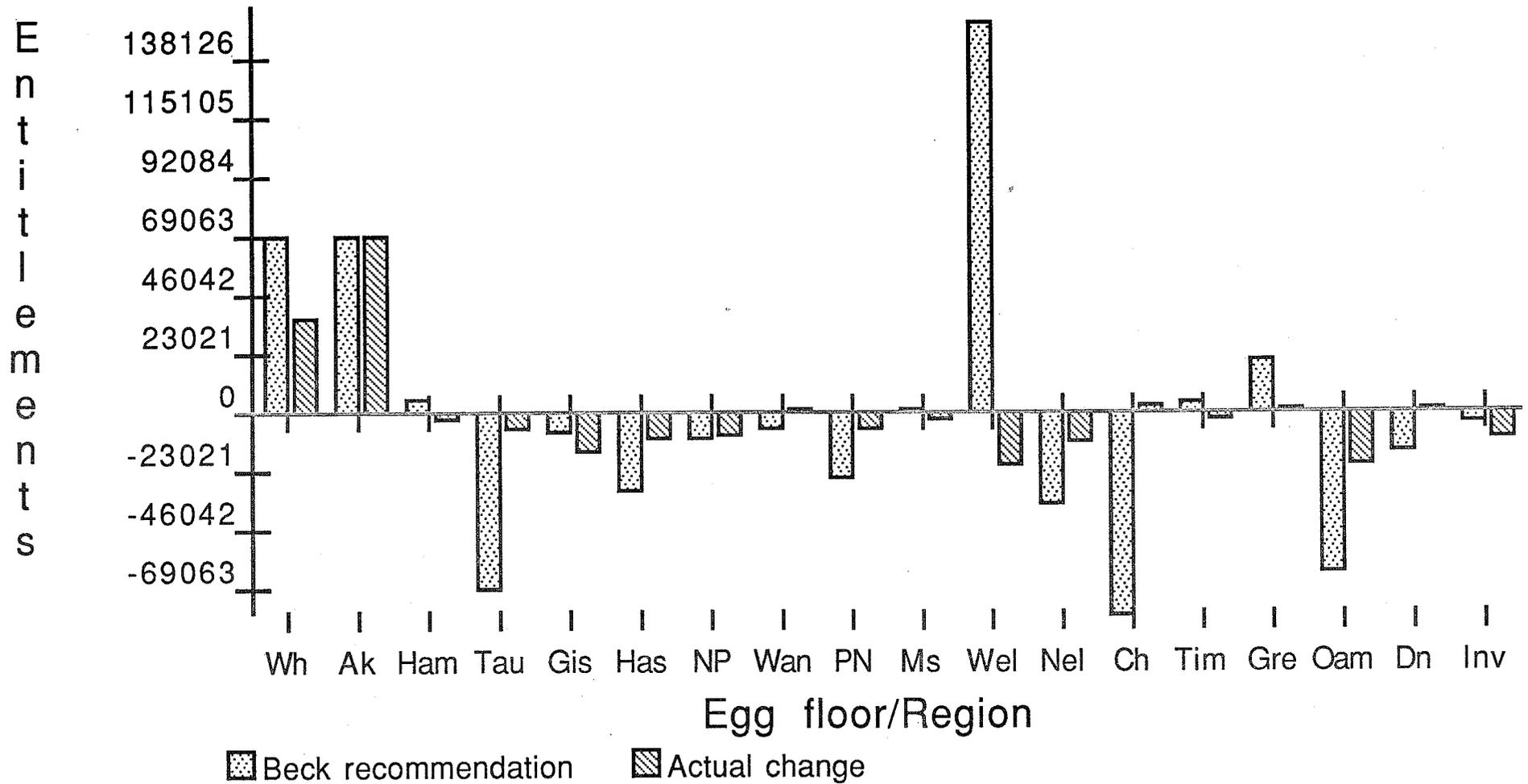
Variables explaining different marginal revenues and marginal costs facing producers in each area were also included. The following regressors were expected on a *a priori* theoretical grounds to have explanatory power:

$N$  = regional population growth rate (from Census 1981 to 31 March 1985);

$\partial P$  = retail price change between 3/86 and 4/87, relative to the average change in all other regions;

Figure 8: Comparison of Regional Changes Recommended by Beck Report<sup>1</sup> With Actual Changes as at September 1987

29



<sup>1</sup> Beck, A.C. and Rathbun, J.P. 1984. "The Optimal Location of Egg Production In New Zealand"

XS = excess capacity on farms which held more than 10,000 entitlements on June 30, 1979 (when transfers ended) as at June 30 1985 (which should have been the same as at the onset of deregulation); and

Cost = regional deviation from the mean cost of producing 1000 dozen eggs (as published in the Lincoln College study of optimal location).

Models with various specifications of the above variables were tried with the main finding of this search being that cost and price relativities were not significant explanatory variables. The insignificance of cost may have been due to the changes which occurred in the feed industry after 1980 (the period from which the data came). The non-significance of regional retail price relativities may have been due to a mis-specification. The more correct, but unavailable variable would be the farm gate price relativities. The use of retail price data would only be correct if changes in marketing margins were similar in all areas. Given the strong a priori theoretical reasons for including a price relativity variable, it's non-significance suggests that the marketing margins did not change equally in all regions.

The model with the best explanatory power, based on the criteria of maximum adjusted  $R^2$ , was:

$$Y = \begin{matrix} ** \\ -12169 \\ (2.87) \end{matrix} + \begin{matrix} * \\ 1458.3 N \\ (1.68) \end{matrix} + \begin{matrix} *** \\ 0.877 XS \\ (3.93) \end{matrix} \quad (2)$$

$F(2,15) = 11.3$   
 $R^2 = 0.60$   
 Durbin Watson  
 statistic = 1.43

Where

Y = regional changes in entitlement holdings after 18 months of free trading.

and N and XS are defined above.

Equation 2 shows that entitlements moved out of areas where population growth and excess capacity in the large farms was low, and into areas where these variables were high. Although the explanatory power of the model was significantly greater than zero, the large unexplained variation (40%) implied that some important explanatory influences had not been captured. Some regional variation in entitlement movements appeared to be due to the protection given egg farmers incomes by distributors. In Canterbury the co-operative egg floor accumulated funds during the period of controlled prices to act as a buffer for the shock of deregulation. In Wellington the egg floor, owned by dairy companies (the Farm Products group), took no such action and

producers took payout drops of approximately 40 cents per dozen at the onset of deregulation (Mears, 1987).

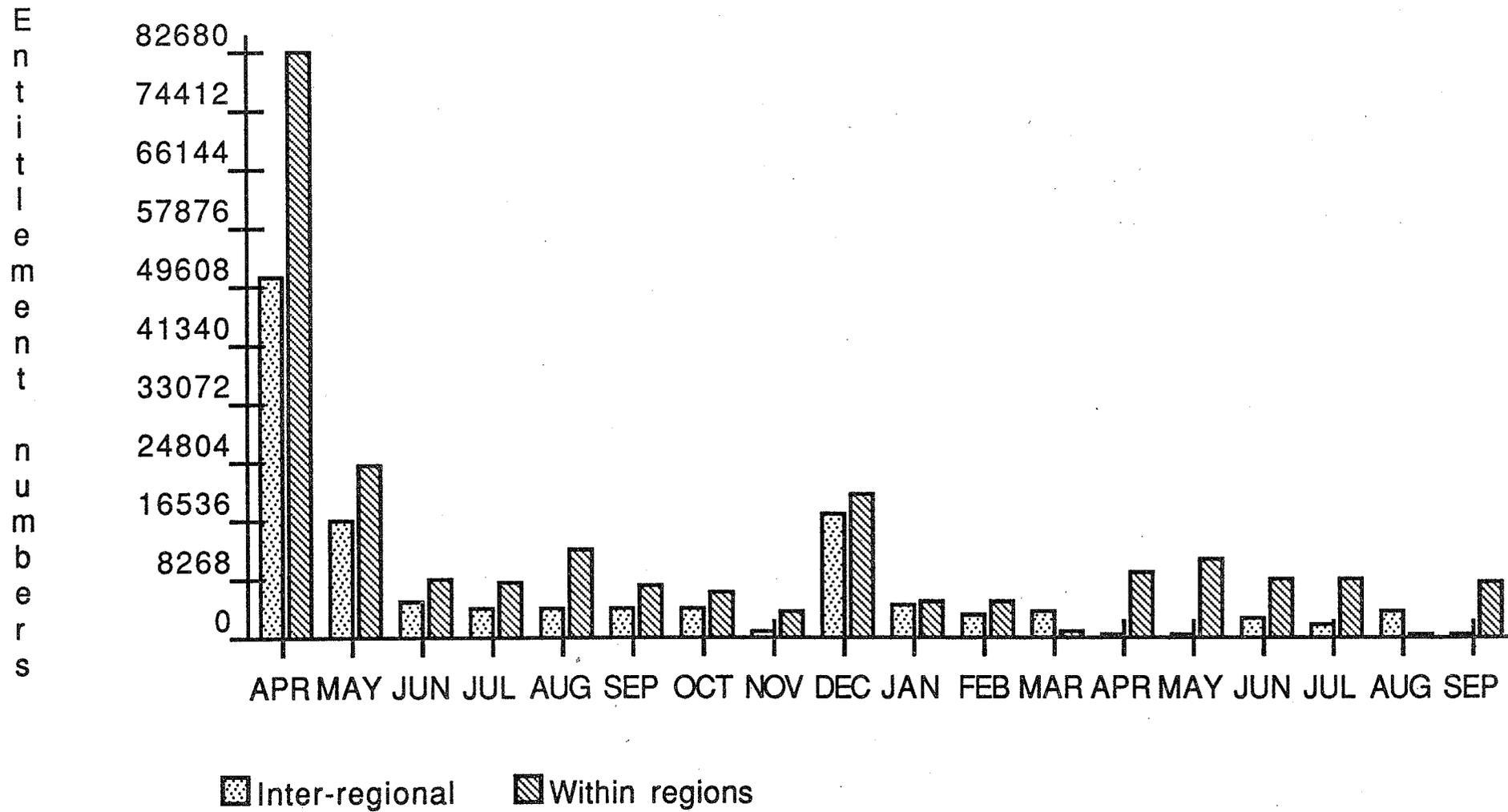
This may explain why Wellington had a net loss of entitlements, and Canterbury a net gain when the optimal location study suggested the opposite should occur. The Farm Products group also controlled other egg floors (Gisborne, Hastings, Wanganui, Palmerston North and Nelson) and in all areas except Wanganui, entitlements moved outwards. This may have been due to the fact that dairy companies were not interested in buffering egg farmer's incomes. The significance of this is that the price signals generating entitlement movements were not necessarily based on comparative regional resource endowments and market distance, so the result was not necessarily optimal.

#### 5.2.2 Inter and Intra-regional Transfers

Almost two-thirds of the entitlement transactions in the first 18 months of deregulation resulted in production staying in the same area. Figure 9 presents monthly data from the time of deregulation onwards which shows that off-farm entitlement transfers within regions were always more common than inter-regional transfers. It also shows the dramatic fall off in sales which occurred as the 1988 review of the industry loomed closer. This confirms the estimate of planning horizons made above. The lack of inter-regional movement was partly a function of the private negotiation method of transfer. The presence of significant transaction costs, specifically the lack of public information about the quantity and market clearing prices of available entitlements, discouraged all but the largest firms from purchasing outside their immediate geographical area. The group buying and selling strategies that some regions utilised were an attempt to lower the transactions cost to individual firms.

The wide variability in entitlement prices (various sources reported figures between \$6 and \$15) that was maintained through the first 18 months of deregulation, rather than converging to an equilibrium level, may also have been due to this lack of market information. These transaction costs prevented the market from allocating entitlements in the most optimal fashion. In similar situations overseas, market clearing agencies have often been set up, although the marketing boards invariably become embarrassed by the high price that quotas sell for and suspend trading or attempt to disguise quota values (Lane and MacGregor, 1979). Supply restricting marketing boards are in a difficult position over this matter. Consumers rightly view high quota values as evidence of excess profits within the industry but it is necessary to provide quota price information to lower the inefficiency losses stemming from imperfect allocation.

Figure 9: Comparison of Intra and Inter-regional Entitlement Transfers, April 1986 - Sept. 1987<sup>1</sup>



<sup>1</sup>Excluding amalgamations and other intra-firm transfers

5.3 Market Conduct

The theoretical model suggested that an egg surplus in the presence of production control was due to the administered price being above that which would have resulted from the restriction in supply. If that was the case then the removal of price and marketing controls would lower prices to the point where restricted supply intersected with demand, i.e. administered pricing would be replaced with cartel pricing. Over-production would then be reduced to the minimum level of acceptable wastage. In fact a significant, although declining, amount of production continued to be disposed of on the secondary market (sales to domestic baking trade, exports of pulp and dried eggs). Table 5 shows this decline in the surplus which represented the impact of regional production cuts and the lagged effect of the March, 1986 entitlement cut.

Table 5: **Egg Receipts, Sales and Surplus of Previously Licenced Distributors<sup>a</sup>**

Year to:	Receipts (million dozen)	Sales (million dozen)	Surplus (million dozen)	Surplus as % of 5 yr average
31/3/87	44.81	39.91	4.87	85%
30/6/87	43.74	39.45	4.29	75%
30/9/87	42.83	38.96	3.84	67%

<sup>a</sup> Based on weekly averages from NZPB, subject to rounding error

The continuation of surplus production may have been due to both a slow rate of adjustment by producers and, to the market power of the established co-operative egg wholesalers, enabling them to maintain above-equilibrium primary market prices. There is some evidence that market sharing agreements were negotiated by distributors. The Canterbury co-operative egg floor maintained approximately 30% of the Wellington market after deregulation by becoming the majority shareholder in, and manager of, the Wellington egg floor. An agreement was reached where the 10% of the Wellington market that Oamaru producers had historically supplied, was serviced with Canterbury eggs, and the Christchurch floor received a like amount from Oamaru. (CCD, 1987).

5.3.1 Retail Prices

Relative regional price changes were used to test if price discrimination was occurring. A ratio of regional retail price changes, relative to the national average was formed from the following formula:

$$\frac{[P_i^* - P_i]}{[P_{NZ}^* - P_{NZ}]}$$

where

$P_i$  = nominal price in region  $i$  at time of deregulation;

PNZ = New Zealand average price at deregulation; and  
 \* = price after thirteen months of deregulation

The larger the ratio, the greater the regional price increase relative to the rest of the country. The highest rates of price increase (excluding Greymouth) were recorded by Tauranga and Christchurch (1.47 and 1.26 respectively). These two centres are in areas of surplus egg production, and along with Hastings, had enacted regional production cuts over and above the V.I.S. scheme. For egg distributors in these centres to sell eggs in other cities, where prices were lower, price discrimination had to have been practised. This was the case with the Christchurch floor supplying Timaru, Ashburton, Greymouth, Blenheim, Kaikoura, Dunedin, Auckland and Oamaru with up to 50,000 dozen eggs per week (Parker, 1987). This indicates the market power of distributors in being able to influence prices, which may have made some contribution to the continuation of excess supply. The fact that many egg floors were producer controlled suggests that the use of market power was seen as an complement to farm level adjustment.

An analysis was carried out on egg price determination to see if the removal of price control changed the relationship between input prices and egg prices. Two explanatory variables were used; the "pig, poultry and other" farming input index and the lag of the egg price index. The time period chosen for analysis was January 1984 to September 1987 which was dictated by the "pig, poultry and other" farm input index only going back that far. This gave 27 observations prior to deregulation and 18 afterwards. Two separate regression equations were estimated with ordinary least squares.

Subperiod I (1/84 to 3/86)

$$\text{REPI} = -0.157 + 0.747 \text{ REPI}_{t-1} + 0.395 \text{ RPPI} \quad (3)$$

\*                      \*\*\*                                      \*\*  
 (1.77)      (6.20)                                      (2.19)

$$R^2 = 0.94 \quad ***$$

$$F(2,24) = 205$$

Durbin Watson  
statistic = 1.28

Subperiod II (4/86 to 9/87)

$$\text{REPI} = 0.777 + 0.315 \text{ REPI}_{t-1} - 0.170 \text{ RPPI} \quad (4)$$

\*\*    \*  
 (2.61)      (1.30)                                      (2.00)

$$R^2 = 0.52 \quad ***$$

$$F(2,15) = 7.95$$

Durbin Watson  
statistic = 1.76

where

REPI = Egg Price Index Deflated by CPI (Dec 1983 = 1000)

RPPI = Pig, Poultry and Other farm input price index,  
 also deflated by CPI

Equation 3 shows that when eggs were under price control, a well balanced, statistically significant relationship was present. The explanatory power of the same equation was much less after the removal of price control, suggesting that a structural break had occurred. To confirm this a Chow test for differences between sets of regression coefficients was carried out.

$$\frac{(SSR_r - SSR_{un})/k}{SSR_{un} / (T-2k)} \sim F(k, T-2k)$$

$SSR_r$  are the sums of squared residuals from the model estimated over the entire period with the restriction that the coefficients in each subperiod be equal.  $SSR_{un}$  are the sums of squared residuals from separate regressions on the pre and post deregulation observations.  $T$  is the total number of observations in both subperiods (45) and  $k$  is the number of parameter estimates needed for the model (3). The null hypothesis that the coefficients of the equations were equal in each subperiod was tested against the alternative hypothesis that they differed. Comparison of the computed  $F$  statistic [ $F(3,39) = 4.26$ ] with the tabled value indicated significant differences between the regression coefficients for the two periods.

The economic significance is that deregulation brought a dramatic change in the relationship between producer input prices and retail egg prices. Under the cost of production method of price fixing a positive relationship between the two variables had existed as input price rises were passed on into egg prices. The negative sign in the post-deregulation period indicated that this relationship had turned around. From August 1985 the real cost of inputs declined; reflecting lower feed prices resulting from international conditions<sup>6</sup>, an increase in New Zealand coarse grain production, and the deregulation of the wheat industry. Figure 2 shows that with the exception of a brief decline in the months immediately after deregulation, real egg prices were constant. The benefits of lower input prices bought about in part by fortuitous international circumstances, and in part by the New Zealand deregulatory policy, were not passed on to egg buyers.

### 5.3.2 Supermarket Survey

A telephone survey of 27 Christchurch supermarket managers, from the Supervalu, Countdown, New World and Woolworths chains was carried out in August 1987. This survey aimed to gauge retail response to the removal of marketing and price controls. These managers had seen three major sources of

<sup>6</sup> World traded prices for coarse grains were US\$18 to \$23 per tonne lower, on average, in 1986 than in 1985 (F.A.O. 1987).

competition in the Christchurch market during the first 18 months of deregulation. In April and May 1986 eggs from the lower North Island and Nelson were distributed through the local dairy co-operative. The second source of competition was from local independent suppliers, with one leaving the co-operative at the onset of deregulation and another three joining him later. These independent marketers estimated that they held 20% of the Christchurch market, mostly in the mixed grade segment. In September 1987 a small quantity of Dunedin sourced eggs were sold through one supermarket chain at prices of \$0.99/dozen, as a retaliation against the Canterbury independent producers who had moved surplus eggs into markets held by the Dunedin floor. The responses to the supermarket survey are given in Table 6.

Table 6: **Supermarket Manager Survey (Affirmative Responses)**

	Individual Managers (27)	Chains (4)
<b>Changed egg sourcing at least once?</b>	21	78%
If 'yes' was it to:		
Dairy co-op	5	19%
Local suppliers	14	52%
Dunedin supply	2	8%
<b>Have you gone back to CCD? (totally)</b>	11	41%
from: Dairy co-op	5	19%
Local suppliers	4	15%
Dunedin supply	2	8%
(concurrently with local independent supply)	10	37%
<b>Why did your return?</b>		
Lower CCD price	4	15%
Inadequate supply	7	26%
<b>Are you selling mixed grade eggs?</b>	22	81%
Proportion of sales		
0 - 40%	3	11%
40 - 80%	13	48%
> 80%	6	22%
<b>Have you exploited distributor competition?</b>	20	74%
<b>Changed margin behaviour?</b>	16	59%
<b>Are consumers better off under deregulation?</b>	23	85%

Most managers reported being able to exploit the competition between distributors, and had changed their egg supplier at least once. In comparison with producers there was a great deal of satisfaction with the deregulation and a belief that consumers had benefitted. The removal of price control led to just over half the managers changing their margin on eggs. Most respondents felt that

there was sufficient competition in the grocery trade to prevent excess profits. Deregulation changed the nature of eggs from being a staple purchase with stable price to an item that could be placed on 'special' and used as a 'loss-leader' to attract consumers. However, this appeared to be the reverse of the trend in other markets, such as Auckland, partly because the consumer had no awareness of the retail margin under deregulation (Mitchell, 1987). The sourcing volatility was such that the co-operative was able to regain a significant market share by providing price competition with mixed grade eggs. Supermarket managers did not report any adverse consumer reaction to mixed grade eggs, whether they were directly from the farm, or via the egg floor.

### 5.3.3 Grading Issues

In contrast to the supermarket managers, the lack of grading standards on independently produced eggs was a major concern for the co-operative producers. At issue was the use of candling to check for blood and meat spots, as it was felt that consumer confidence would decline without this quality control. The independents were seen as possibly imposing an externality on all producers because consumers could not differentiate between farm-sourced and floor-sourced eggs.

Most analysis of the welfare impact of quality standards deals with the case where consumers can evaluate quality before purchase (Bockstael, 1984). This is not possible with eggs so a lottery is operating where consumer welfare changes due to sorting and grading depend upon their attitude towards risk. The fact that consumers were able to buy uncandled eggs at the farm gate under marketing controls suggests that candling was a marketing service compulsorily attached to retail sales, resulting in a loss of welfare for consumers who preferred cheaper eggs with more risk. Eggs appear to be an "experience good" (Bowbrick, 1982) in that consumers perceptions of quality are derived by previous consumption experience. Thus attempts by co-operatives to differentiate their eggs, by advertising them as having 'high marketing services' are not likely to be successful given the lack of brand identification and loyalty that the supermarket survey indicated.

### 5.4 Analysis of Social Costs

A comparative statics approach was used to compare the producer surplus, consumer surplus and social costs for representative years prior to and after the deregulation. Consumers were defined as all participants in the marketing chain beyond the farm gate, with the distribution of any increase in consumer surplus due to deregulation being estimated using marketing margins. The fact that there was still significant excess supply in the deregulated industry in 1987 indicated that the use of the theoretical model embodied in Figure 7 would be inappropriate. However the reduction in the surplus, which Table 5 showed, indicated that adjustment

was still taking place so estimates of social cost after 1986 must be regarded in a short term context only.

The uncertainty, that was mentioned in Chapter 2, about the true magnitude of egg production has implications for the analysis of the social costs of the two regimes. This study is based only on data from the controlled sector, and it is likely that the true social costs are larger than estimated if the controlled sector acted to set the price for backyard production. In addition the estimates of social cost in the absence of marketing controls are hampered by the fact that producers are now free to market their eggs anywhere and no data exists for this independent distribution sector. Therefore the only directly comparable figures, in the pre and post-deregulation environment, are the wealth transfers and social costs per dozen because the quantities handled by egg floors were different.

#### 5.4.1 Estimation of the Retail Demand Curve

Quarterly data from 1980(I) to 1985(IV) were used to econometrically estimate the following demand function.

$$Q^d = 3.43 - 0.0065 P + 0.0031 Y - 0.43D1 - 0.11D2 - 0.17D3 \quad (5)$$

(3.06)	(0.72)	(1.70)	(7.47)	(1.82)	(2.91)
	[-0.22]	[0.58]			

$$F(5,17) = 15.77$$

$$R^2 = 0.82$$

Durbin Watson  
statistic = 1.85

where

$Q^d$  = quarterly sales of eggs by licenced marketing agents per head population in urban marketing areas  
 $Y$  = real disposable income index, middle quintile,  
 $P$  = quarterly weighted moving average retail egg price, deflated by the food price index; and  
 $D1$ ,  $D2$  and  $D3$  are dummy variables to capture the seasonality with 4th quarter variation in the intercept term.

The above equation was estimated with ordinary least squares on rho-transformed variables to remove the effects of autocorrelation. The original specification had a Durbin Watson statistic of 0.86, leading to the rejection of the null hypothesis that the coefficient of autocorrelation was zero. The autocorrelation coefficient, rho was estimated using the Cochrane - Orcutt technique of gradual approximation. The overall equation was statistically significant, even though a key explanatory variable, own-price was not statistically significant. The reason for this is that real prices fell throughout the entire period (as shown by Figure 2) whilst consumption was essentially stagnant.

The economic interpretation of this is that eggs are

price inelastic, probably being more of a habitual purchase. The average retail price elasticity of eggs was estimated to be -0.22, which compares closely with figures of -0.23 for Australia as a whole (Beck, 1974) and -0.3 for the state of Victoria (Alston, 1986). The price elasticity at farm level was worked out using the following formula for constant margins:

$$E_{\text{farm}} = E_{\text{retail}}(P_{\text{farm}} / P_{\text{retail}})$$

with the farm price plus 10% egg floor commission in 1984 being \$1.52/dozen for grade 6 eggs and a retail price of \$1.83, giving a farm level elasticity of -0.18. The low value for the estimated income elasticity of demand further confirms the view of eggs as a habitual purchase, not greatly influenced by income levels.

#### 5.4.2 Estimation of the Supply Functions

It was not possible to econometrically estimate any of the supply functions because the time series data on farm price and output traces out movements in, rather than points along the supply function. This was due to the entitlement-cutting actions of the Poultry Board, both seasonally and permanently. The approach used was to estimate the costs due to production control and subtract them from the producer price to give a point on the free supply curve. In Figure 6 this would be the distance  $dg$ , between  $S_1$  and  $S_2$ , at output  $Q_n$ . The main methods of estimating the cost of production control have been by comparing with an unregulated industry (Veeman, 1982; Alston, 1986) or by using quota values as a measure of the wealth transfer from consumers to producers (Arcus, 1981).

Veeman (1982) found the second method provides very conservative estimates of social costs due to heavy discounting by producers for future regulatory uncertainty, and administrative attempts to conceal quota values. Lacking data on a similar industry and noting the problems with using only quota values, it was decided to use a combination of methods to estimate the free supply curve. The cost of production control was partitioned into three parts: that due to suboptimal location; that due to suboptimal size and the annual return on quota that producers expected.

In 1984 entitlements had nil value by regulation, but the Poultry Board had proposed a buying price of \$8 per licence in a presentation to the government. Veeman (1982) used a 14% discount rate for estimating quota rents in Canada. This value is much higher than the real rate of return normally felt to be acceptable for agriculture, but is supported by Alston (1986). He found the annual hen quota rental rate in New South Wales to be 15.6%, of the purchase price of quota (the only instance of entitlement rental in N.Z. occurred in 1987 at a rate of \$1.25/bird licence/year, when selling prices were in the order of \$8/licence, implying a 16% discount rate). It appears that producers heavily downweight future returns to quota, reflecting uncertainty

about the future of the supply restricting program. Assuming 21.5 dozen eggs/entitlement licence/year (see Section 5.1.2) a 15% discount rate gives a quota rent of 5.6 cents per dozen with an infinite time horizon. Reducing the time horizon to 10 years to reflect producer uncertainty gives an annual quota rent of 7.4 cents per dozen.

Estimates of the cost of suboptimal location are provided by the Lincoln College study commissioned by the Board. Potential savings due to relocation with existing facilities were \$700,000 per annum and with the building of new facilities, \$1.4 million per annum. This gives a lower bound of 1.4 cents per dozen and an upper bound of 2.8 cents per dozen. The cost due to inability to achieve scale economies was estimated by using the 1979 Cost of Production data for different sized farms, to map out the long run average cost curve. Based on the average entitlement size in each of the classes sampled and the cost of production that was worked out by the survey, the following three data points were available: 4540 birds, 85.64 cents/doz; 7650 birds, 76.16 cents/doz; and 15340 birds, 68.32 cents/doz. It was observed that the proportionate change in price was constant, in keeping with a smoothly declining U-shaped curve, so an extrapolation on this basis was made out to 36510 birds, 61.3 cents/doz.

The 1979 survey gave a weighted average cost of production as 72.58 cents per dozen, so the cost of suboptimal size was  $(72.58 - 61.3) = 11.28$  cents per dozen. This was put in 1984 terms by inflating with the rate of increase in retail egg prices (1.66) to give a value of 18.7 cents/dozen. As a comparison, Alston (1986) estimated the same costs in Victoria to be between 16.5 and 20 cents per dozen, which when converted at an exchange rate of NZ\$1.28/Aust\$ and deflated back to 1984 yielded an estimate of 17.2 - 21.3 cents for an industry of similar size, with similar controls. Putting a range on the cost due to inefficient size of 16 to 20 cents/doz and summing the three components gave a total cost of production control at  $Q_n$  of between 23 and 30.2 cents/dozen. This does not include the factor misallocation resulting from the use of an input quota.

It was then necessary to assume supply elasticities to provide linear estimates of the supply functions  $S_1$  and  $S_2$ . Two values were assumed, a short run figure of 0.7 as used by Alston (1986) and the BAE (1983) and a longer run figure of 1.5. With the short run elasticity the estimated supply functions intercepted the horizontal axis which is theoretically incorrect as it suggests a positive output at zero price. Statistically estimated supply curves often have this problem because the intercept term falls well outside the range of data used to estimate the curve. The correct specification would be a non-linear approach towards the origin (Kim *et al.*, 1987) but the level of geometry would be beyond this research. It was assumed that the pivotal shift was from the horizontal axis, and in the longer run case, from

the price axis. Having estimated at least one point on each supply curve and the demand curve it was possible to estimate free trade parameters and derive social costs.

#### 5.4.3 Social Cost Estimates

For 1984, our representative year prior to deregulation, supply elasticities of 0.7 and 1.5 were combined with 'high' and 'low' estimates of the cost of production control to give four scenarios. The 'high' social cost assumed that production control led to eggs being 30.2 cents/dozen more expensive, at the margin, than they would be if the industry was operating on the free supply curve  $S_1$ . The 'low' value of this supply shift was 23 cents/dozen. These two values can be considered to be the bounds for distance  $dg$  in Figure 6.

For the post-deregulation period all social costs were calculated under the assumption of a supply elasticity of 0.7. The costs due to inappropriate location were assumed to be reduced by the factor of the correlation between actual entitlement movements and the recommendations of Beck *et al*, and the cost due to suboptimal size was reduced by a factor of 0.78 to reflect the increase in average entitlement holding between 1984 and 1987. The estimates of the inefficiency loss due to suboptimal size and location were inflated to 1987 terms with the rate of change in consumer prices. 'High' and 'low' estimates of social cost were based on the assumptions used for 1984 and combined with quota rentals specific to 1987 data.

Two, of the three, estimates of annual quota rental assumed that producers had the same discount rate as in 1984 and were based on an entitlement value of \$10 per bird licence. With a time horizon of five years a 13.9 cents/dozen quota rental was implied, which increased to 20.4 cents/dozen if producers reduced their time horizon to 3 years (as suggested in section 5.1.2). The final estimate of quota rental was set at zero to indicate what magnitude of costs and transfers would occur in the time period immediately following an abolition of the entitlement scheme. This requires an assumption of no new entrants, and no internal expansion, for the industry in the first 12 months following the removal of quotas. It is more likely that a six month lag would be present, given the need to raise hens from the chick stage, and after that time there would be a movement back towards the free supply schedule.

The post deregulation farm price ( $P_n$  in Figure 6) was estimated from Canterbury data with regional levies to cover the cost of overproduction being subtracted out. Figures on the returns from secondary market sales were not available for the post deregulation period, so a value of 85 cents per dozen was assumed, noting that prices to the domestic baking trade were set to cover costs from July 1984 onwards (NZPB, 1986). Parameter values used to estimate the

free market equilibrium ( $P_e$ ,  $Q_e$ ) in 1984 and 1987 are listed below.

Table 7: **Parameter Values Used in the Social Cost Estimates**

Parameter	1984	1987	Explanation
$Q_n$	51.876 m doz	43.736 m doz	Receipts by licenced agents
$Q_d$	46.987 m doz	39.446 m doz	Fresh sales by " "
$P_n$	\$1.2703/doz <sup>a</sup>	\$1.35/doz <sup>a</sup>	Producer payout
$P_s$	\$0.62/doz <sup>b</sup>	\$0.85/doz	Secondary market egg price
$\epsilon_d$	-0.18	-0.18	Demand elasticity
$\epsilon_s$	0.7, 1.5	0.7	Supply elasticity

<sup>a</sup> With proportion of levies for surplus disposal subtracted out.

<sup>b</sup> From IDC (1984 p24) showing loss of 96.5c/doz on surplus, and non-cost recovery on sales to bakery trade

Equilibrium prices and quantities were estimated from the following formulas.

$$Q^s = a + bP \quad (6)$$

where  $a = Q_n(1 - \epsilon_s)$  and  $b = \epsilon_s(Q_n/C_n)$

$$Q^d = c - dP \quad (7)$$

where  $c = Q_d(1 - \epsilon_d)$  and  $d = -\epsilon_d(Q_d/P_n)$

$$Q^s = Q^d \quad (8)$$

The symbols are algebraic representations of the points on Figure 6. Social costs and changes in producers and consumers surplus were then derived as deviations from the estimated equilibrium values.

The loss of consumer surplus (CL) was calculated as:

$$CL = 0.5[(P_n - P_e)(Q_d + Q_e)] \quad (9)$$

The gain in producer surplus (PG) was calculated by comparing the producer surplus under controls (PS2) above  $S_2$  with price  $P_n$ , with that under the free market (PS1) above  $S_1$  with price  $P_e$ .

$$PG = PS2 - PS1 = [0.5(P_n * Q_n)] - [0.5(P_e * Q_e)] \quad (10)$$

The social cost due to the supply shift (SC(1)) was estimated by subtracting PS2 and the resource cost of output  $Q_n$  (measured under  $S_1$ ) from the industry total revenue.

$$SC(1) = (Q_n * P_n) - PS2 - [0.5(Q_n * C_n)] \quad (11)$$

and the social cost of oversupply (SC(2)) was estimated by subtracting surplus disposal revenue from the resource cost of surplus output:

$$SC(2) = \{0.5[(Q_n - Q_d)(g + h)]\} - [P_s * (Q_n - Q_d)] \quad (12)$$

where  $h$  was the price at which  $S_1$  equaled  $Q_d$ .

The estimates of surplus transfers, and social costs for 1984 and 1987 are presented in Table 8. It can be seen that in 1984 price and production controls caused annual wealth transfers from consumers to producers of between \$8m and \$13m. The gain in producer surplus ranged from \$18,000 to \$30,000 per entitlement holder and the loss in consumer surplus was between 28 and 38 cents/dozen. Even at an upper bound consumption estimate of 300 (25 dozen) eggs per year the cost to an individual consumer would be a maximum of only \$9.50 per annum, indicating the asymmetrical distribution of costs and benefits. The social costs in the 1984 year were between \$5.9 and \$9.5 million which was approximately 7% to 11% of retail sales within the licenced marketing areas.

The social cost of overproduction was much less than the monetary loss on surplus disposal because part of the payment for excess supply became a gain in producer surplus. The higher social costs under an assumed supply elasticity of 1.5 were mainly due to a greater shift in the supply curve. More elastic supply did not provide lower competitive prices due to the estimated point  $g$  being to the right of the equilibrium. As a comparison, an output quota on eggs, set at  $Q_d$  and using the 'low' social cost assumption and short run elasticity would provide only \$0.4 million less producer surplus but have a social cost of approximately half, at \$3.51 million.

The 1986 removal of price and marketing controls produced a small but unequivocal reduction in the wealth transfer from consumers to producers and lowered the social cost due to oversupply. This was offset by the increase in social cost due to the supply shift, with the increased optimality of size and location being counteracted by producers expectations of higher quota rents. The net effect was that measurable social costs declined in the aggregate, but not on a per unit basis. The increase in SC(1) at higher quota rentals reflected payments for entitlements to producers who had left the industry and provides a measure of the compensation they received. The scenario of 'zero quota rent' indicated that there would still be substantial, although declining, social costs in the period immediately following an abolition of the entitlement scheme as the industry moved towards the free supply curve. Conversely, comparing the 'zero quota rent' estimates with those for 'high' social cost suggests that wealth transfers of between 7 and 12 cents/dozen, and a social cost of 5 cents/dozen, occur due to producer's rent expectation. Such rent expectation is only possible in an industry with substantial entry barriers.

		1984				1987 <sup>a</sup>			Change For $\epsilon_s = 0.7$ cents/doz (1984 terms)
		<u><math>\epsilon_s = 1.5</math></u>		<u><math>\epsilon_s = 0.7</math></u>		<u><math>\epsilon_s = 0.7</math></u>		Zero Quota Rent	
		'High'	'Low'	'High'	'Low'	'High'	'Low'		
Cn	(\$/doz)	0.97	1.04	0.97	1.04	0.88	1.01	1.11	
Pe	(\$/doz)	0.93	1.00	0.90	0.96	0.83	0.94	1.02	
Qe	(m doz)	49.24	48.79	49.45	49.06	42.17	41.62	41.18	
<b>Consumer Loss<sup>b</sup></b>									
	(\$m)	16.25	12.99	17.82	14.93	13.76	10.97	8.69	
	(\$/doz) <sup>c</sup>	0.35	0.28	0.38	0.32	0.34	0.28	0.22	-4
<b>Producer Gain</b>									
	(\$m)	9.56	8.04	13.55	11.83	8.77	7.10	5.75	
	(\$/doz) <sup>d</sup>	0.18	0.15	0.26	0.23	0.20	0.16	0.13	-6
<b>Social Cost</b>									
SC(1)	(\$m)	7.92	5.97	5.54	4.18	5.95	4.68	3.61	
SC(2)	(\$m)	1.54	1.90	1.37	1.71	0.04	0.24	0.52	
Total	(\$m)	9.46	7.87	6.91	5.89	5.99	4.92	4.03	
	(\$/doz) <sup>d</sup>	0.18	0.15	0.13	0.11	0.14	0.11	0.09	0

<sup>a</sup>All 1987 figures, except Cn, Pe and Qe deflated to June, 1984 level (CPI was 1.53X higher in 1987 than 1984)

<sup>b</sup>Consumers includes wholesalers and retailers

<sup>c</sup>Based on domestic consumption

<sup>d</sup>Based on domestic production

Whilst there was an aggregate loss of producer surplus, the reduction in producer numbers saw an average gain, due to controls, of \$22,000 to \$27,000 per producer for the year to June, 1987. This was within the range of the 1984 estimates so there was no evidence to suggest that the remaining producers were worse off than they had been. Indeed, the theory suggested that transferrable entitlements would make both producers who continued, and those who left, better off than under the non-transferrable situation. The analysis was only based upon the producer surplus on eggs marketed by the established floors so does not include the benefits accruing to direct marketing producers, who would also capture any of the consumer surplus gained by the wholesale sector.

The 1987 estimates of the social cost due to oversupply showed a significant decrease from 1984, although in both cases the cost of oversupply was much less than the cost due to production control. Using data for the year to September, 1987 to mirror the adjustment which was taking place, would further lower the estimates of social cost. The movement towards more efficient production location and size did not bring an obvious reduction in social cost due to the greater quota rents being obtained. However if time horizons and/or discount rates were adjusted, to reflect greater certainty after the 1988 industry review, the quota rent estimates would decrease thereby lowering the social cost estimates. The evidence at hand suggests that the deregulation was successful in reducing the market distortions which had favoured producers. However when compared with the competitive equilibrium the partially deregulated environment is still marked by a substantial wealth transfer from consumers to producers and losses of social welfare.

#### 5.4.4. Distribution of the Consumer Surplus Gains

The above analysis treated all participants in the marketing chain beyond the farm gate as "consumers" whereas the aim of the reform was to improve the welfare of households. The distribution of the 4 cent/dozen gain in consumer surplus can be estimated from marketing margin data. In 1984 the farm level price of eggs was 74% of retail and the wholesale price 91%. Data on a national level became unavailable after the deregulation but using Canterbury prices for grade 6 eggs the farm level price had fallen to 69% and the wholesale price to 89% of the retail price. The evidence of increasing marketing margins and a greater rate of nominal price increase suggests that the gains in consumer surplus flowed to distributors and retailers. This may have been due to an attempt by the retail sector to gain a markup on eggs, similar to that of other perishables.

Some of the increase in marketing margin was brought about by fragmentation bringing higher charges in cartoning costs and could be viewed as an inevitable consequence of the deregulation. However, a lack of contestability in retail and

distribution sectors, which prevented households from gaining the benefit of the reform, was reported by the Chairman of the Poultry Board (Briggs, 1986). The deregulation was coincidental with the introduction of the 1986 Commerce Act which was designed to prevent an appropriation of surplus by marketing institutions engaged in non-competitive behaviour. The dominant position of the established distribution agents, many of which were producer owned co-operatives meant that in the first 18 months under deregulation the presence of independent distributors resulted in competitive pricing only for certain grades of eggs, in some localities. The stated aim of the deregulation in providing lower consumer prices was not universally achieved.

## CHAPTER 6

### SUMMARY AND POLICY IMPLICATIONS

#### 6.1 Implications of the Analysis for the Deregulation Strategy

The empirical analysis showed that some of the predictions of the competitive, theoretical model, which appeared to form the basis of the policy recommendations of both the IDC and Government departments, had not occurred after the first 18 months of deregulation. No specification was ever made within the model of the adjustment processes, or the time needed for their completion, in the movement away from industry-specific controls. If that deficiency of the theoretical model implies instantaneous adjustment to the lifting of controls, then the model was clearly incorrect. The fact that different sectors and regions adjusted at different rates indicates that account should have been taken of the influences on the adjustment process.

The evidence relating to price discrimination, horizontal integration and market sharing agreements suggested that market power was being exercised by some producer and distributor groups. This exercise of market power undoubtedly contributed to the regional disparities in egg price movements with consequent implications for the relocation of production. The proprietorial linkages between producers and distributors, under the co-operative form of organization, meant that restrictions on free entry into the egg producing sector also led to a lack of contestability in the distribution sector. Thus the only source of competition amongst distributors, once horizontal integration and market share arrangements were negotiated, was from independent egg producers. The entitlement scheme, by imposing a substantial barrier to new entrants, allowed rent expectation by producers.

An associated factor in the non-achievement of the predicted gains of reform was the lack of rigour in the general economic regulations which replaced industry specific controls. In the area of anti-competitive activities, the 1986 Commerce Act was meant to ensure that the efficiency gains from deregulation were passed on to consumers in the form of lower prices<sup>7</sup>. However, because the Commerce Commission had to prove, under Section 36 of the Act, that dominant market positions were used for the purpose (rather than had the effect) of; restricting entry, deterring

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<sup>7</sup> Press Statement by Ministers of Trade and Industry, and Agriculture and Fisheries, 10 October, 1985.

competitive conduct, or eliminating any person from a market, no action was brought against egg distributors exercising market power.

The evidence on retail price determination indicated that lower feed prices were not passed on to egg consumers and the rate of increase in retail egg prices in the deregulated environment was higher than in the controlled setting. This indicates that there were no synergistic gains from the general economic liberalisation, which included some input-supply industries for the egg industry, that was going on in the same time period. It appeared that the benefits of falling real input prices were captured largely by producers, distributors and retailers.

In support of the theoretical model underpinning the deregulation, the evidence did seem sufficient to infer that there was a movement towards a more efficient production sector. This movement was both in terms of the location and the size of production units. This structural adjustment took place within the confines of the insulation offered by production licencing, to incumbents and involved changes in their numbers and time horizons. The continuation of some excess supply indicated that overall supply response did not adjust as rapidly as a simple model would predict.

The most substantive implication of the research is that the policy of incremental deregulation has enabled some groups to achieve substantial benefits whilst losses are still widely diffused amongst consumers. The marketing arrangements currently in place indicate that competition does not automatically result from a removal of economic regulation. In planning the deregulation, greater emphasis should have been placed on the role of marketing institutions. A deregulation, by altering the distribution of government sanctioned rents, essentially attempts to reassign, or redefine property rights. This study has shown that costs of adjustment and vested interests imply that such changes are unlikely to be smoothly achieved.

The implications of these findings for other recently deregulated agricultural industries depends upon the ability of producers, in those industries, to influence prices. As Sandrey (1988) notes, agricultural commodities are generally characterised by inelastic demand indicating potential producer benefits from exploitation of market power in the form of price-making. In the presence of entry barriers the scope exists for legislative pricing to be replaced with producer determined, rather than market determined, pricing with the result that the wealth transfers from consumers are not reduced after the removal of regulation.

## 6.2 Areas For Further Research

The reduction in the statutory powers of the Poultry Board means that analysis of the deregulated industry was

hampered by a scarcity of data observations. Moreover, the absence of controls led to greater inter-temporal and inter-regional price variability so average values, or data derived from only one region, is less robust than it once was. The egg industry warrants continued observation to ascertain whether the findings of this research are based on incomplete adjustment to the 1986 reform. Until then, no firm conclusions on the usefulness of the theoretical deregulation model can be made.

An alternative approach to the estimation of the free supply function would be useful in testing the estimates of social costs and wealth transfers. The most promising approach would be to build up a synthetic supply function from firm-level data. Confirmation of the elasticity of the unrestrained supply function would be useful in predicting the effect on prices of a removal of production control. Many of the submissions to the I.D.C. review claimed that the removal of controls would lead to a situation of cyclical price variability (IDC, 1985). This is a testable hypothesis, which could be subjected to a 'cobweb' model analysis based on empirical elasticity estimates.

A further area of necessary research concerns the response of producers to supported and free prices. Hallam (1978) analysed the removal of British egg price supports in 1971 by testing the relationship between chick placements and input and output prices and concluded that response was greater in a supported market because there was less risk. The New Zealand experience suggests that supported prices can hinder adjustment by maintaining some producers who would otherwise be uneconomic. A test of Hallam's model with the New Zealand data would be a useful exercise.

### 6.3 Conclusions

The deregulation of the New Zealand egg industry in 1986 was part of a general economic liberalisation strategy. The specific aims were to lower consumer costs and introduce more competition into the industry, in the expectation that greater economic efficiency would result. The deregulation was partial in nature, affecting only marketing and price controls. The government rationale for maintaining production control was to prevent surplus production and provide a compensation mechanism for producers leaving the industry.

The prices paid for entitlements indicated a rapid adjustment of producer's time horizons to the forthcoming 1988 industry review. Producers who left the industry were compensated by selling entitlements. Even though the aggregate wealth transfer to producers declined, individuals who remained were not worse off than they had been because the aggregate stream of rents gained by production control was shared amongst fewer of them. The major influence on regional production movements was the relative magnitude of excess capacity. The market power of some distributors was used to

protect producer incomes, and had an influence on the direction of entitlement movements. The presence of significant transactions costs limited inter-regional entitlement movements.

Deregulation changed the nature of egg price determination. The benefits of lower input costs, in part relating to the general economic liberalisation, were not carried through into retail egg prices. There was still a significant, but declining, excess supply of eggs after the first 18 months of deregulation, indicating that adjustment was not complete. There was some evidence of price discrimination and market sharing agreements. There was a small reduction in the aggregate transfer of wealth to producers, with the surplus being gained by distributors, retailers and, in areas with competitive distribution systems, consumers. The social cost of the remaining regulations was similar to the previous situation. The lack of reduction in social cost appeared to be due to the partial nature of the deregulation as producers expected a higher return on quota than previously, resulting from their shortened time planning horizon. The continuation of the entitlement scheme may have helped in the reduction of the surplus but it also acted as a insulative barrier which made producer rent expectation possible.

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APPENDIX A

**REVIEW OF ENTITLEMENT SCHEME FOR THE EGG INDUSTRY:  
TERMS OF REFERENCE**

In 1985, the Government announced the removal of a number of controls specific to the egg industry. These included the removal of any limits on the number of "entitlements" held by individual producers, and also the lifting of restrictions on the transfer of "entitlements" between producers. An entitlement is a quantitative restriction on the number of birds a producer may farm. At the same time, the Government announced that the system of controlling production through the entitlement system should be reviewed in 1988. Since then the Government has also announced a comprehensive review of a large number of statutory bodies, including the New Zealand Poultry Board.

In accordance with the Government's wishes, the Department of Trade and Industry invites submissions from any interested party on:

- (a) the effects of the deregulation from 1 April 1986, of the egg industry, on the supply, price and quality of eggs available to the public.
- (b) the mechanisms and economic effects of the current entitlement scheme as a means of operating statutory production controls.
- (c) the need for the continuation of statutory controls on the production of eggs in the national interest.
- (d) the need for, and appropriate composition of a statutory body for the egg industry, in the presence/absence of statutory production controls.

Persons or organisations wishing to make submissions may do so in writing, no later than Friday 29 April, addressed to:

Egg Industry Entitlement Review  
Department of Trade and Industry  
(BC2B)  
P O Box 1473  
WELLINGTON



**APPENDIX B**

**Budget For a 20,000 Bird Farm in Canterbury Constrained by Entitlement Cuts**

Assumptions

Brooding 0 - 6 weeks; Rearing 7 - 18 weeks; Laying cycle 51 weeks  
 Rearing mortality 2.4%; Laying Mortality 11.72%  
 Feed consumption/bird: Brooding 39.2 g/day; Rearing 101 g/day; laying 123 g/day  
 Management: Birds carried over 12 month lay period with mixed age birds in the same shed;  
 Bird numbers: Operation built new in 1978 with 20,000 bird capacity (owner holding same number of entitlements)  
 Across-the-board 10% entitlement cut on 1/6/83 and 7% cut on 31.3/86 reduced base entitlement level to 16740  
 VIS and CCD production cuts limit operative entitlements to an average of 15010 from 1/4/86 to 31/3/87  
 and 14826 from 1/4/87 assuming the proposed CCD 4% cut planned for 1/1/88 is not implemented  
 Farm gate price is based on transport cost for Rangiora location

<b>Base Information</b>	1986/87	1987/88
Egg Production/hen housed/yr	265	265
Farm Gate Price (\$/dozen)	\$1.44	\$1.46
Interest rate (decimal)	0.2	0.2
Operative entitlements	15010	14826
Entitlement utilisation*	0.952	0.963
Labour cost (\$/hour)	\$7.50	\$7.69
Chick placements	15360	15360
Average bird number	14290	14277

<b>ITEM</b>	<b>UNIT PRICE</b>	<b>QUANTITY</b>	<b>1986/87 \$</b>	<b>QUANTITY</b>	<b>1987/88 \$</b>
<b>Revenue</b>					
Eggs (dozen)		359900	\$518256	361152	\$527281
Cull hens	\$0.60	13051	\$7831	12988	\$7793
<b>Total Revenue</b>			<b>\$526087</b>		<b>\$535074</b>
<b>VARIABLE COSTS**</b>					
<b>Rearing Expenses</b>					
Day Old Chicks	\$1.75	15360	\$26880	15360	\$27552
Chick Vaccine	\$0.07	15360	\$1075	15360	\$1102
Poultry Board Chick Levy	\$0.30	15360	\$4608	15360	\$4608
Starter feed @1.65 kg/bird	\$0.36	25344	\$9200	25344	\$9430
Grower feed @ 6.35 kg/bird	\$0.30	97536	\$28773	97536	\$29492
General labour	\$7.50	768	\$5760	768	\$5904
Debeaking labour	\$7.50	64	\$480	64	\$492
Medication	\$0.20	15360	\$3072	15360	\$3149
Cleaning/disinfection	\$0.03	15360	\$461	15360	\$472
Electricity & fuel	\$0.08	15360	\$1229	15360	\$1260
<b>Total Rearing Expenses</b>			<b>\$81538</b>		<b>\$83461</b>
<b>Laying Costs</b>					
Feed @ 44.77 kg/bird	\$0.31	639742	\$199599	639201	\$204416
Labour @320 hours/1000 birds	\$7.50	4573	\$34295	4569	\$36001
Poultry Board & CCD Levies		\$3.82	\$54586	\$2.93	\$41833
Medication/vet. costs	\$0.13	14290	\$1858	14277	\$1902
Cleaning/disinfection	\$0.03	14290	\$429	14277	\$439
Electricity	\$0.57	14290	\$8145	14277	\$8342
Repairs etc @ 1% laying costs			\$2989		\$2929
<b>Total Laying Expenses</b>			<b>\$301901</b>		<b>\$295862</b>

<b>Working Capital</b>					
Interest on chick rearing cost'	0.2	\$40769	\$8154	\$41731	\$8346
Interest on laying costs****	0.2	\$30190	\$6038	\$29586	\$5917
<b>Total Working Capital Cost</b>			\$14192		\$14263
<b>Total Variable Cost</b>			\$397631		\$393587
<b>Returns Above Variable Costs</b>			\$128456		\$141487
<b>FIXED COSTS</b>					
Administration @ 1 % Variable cost		397631	\$3976	393587	\$4034
Utility @ 120 km/week	\$1.00	6240	\$6240	6240	\$6396
Car @ 60km/week	\$0.60	3120	\$1872	3120	\$1919
Tractor @ 4 hours/month	\$25.00	48	\$1200	48	\$1230
Insurance @2% capital value	0.002	947123	\$1894	947123	\$1942
<b>Depreciation</b>					
Buildings @ 5%	0.05	491363	\$24568	491363	\$24568
Plant @ 10%	0.10	205760	\$20576	205760	\$20576
Dwelling @ 15% to business	0.05	16500	\$825	16500	\$825
Car @ 25% to business	0.10	5000	\$500	5000	\$500
<b>Total Depreciation</b>			\$46469		\$46469
Rates	(@0.5% land and buildings)		\$3057		\$3179
Interest Charges*****	(see attached schedule)		\$62405		\$59490
<b>Total Fixed Costs</b>			\$127114		\$124659
<b>PROFIT/LOSS</b>			\$1343		\$16828

<b>Fixed Asset Schedule</b>		<b>(Replacement Value)</b>			
	Units	Quantity	Unit Cost	Total Value	
Layer sheds (4)	sq metres	582.9	\$160	\$373056	
Cages, feeders, drinkers				\$138240	
Ancillary plant				\$17920	
				\$529216	
Brooding Shed	sq metres	150	\$192	\$28800	
Automatic feeders, drinkers and other plant				\$2600	
				\$31400	
Growing Shed	sq metres	465.67	\$160	\$74507	
Cages, feeders, drinkers, other plant				\$28000	
				\$102507	
Other Buildings	(Egg shed, Cool store, workshop)			\$15000	
Land	hectares	6	\$20000	\$120000	
<b>Plant &amp; Vehicles</b>					
Utility				\$14000	
Misc. Tools				\$5000	
Dwelling, Garage & Car				\$130000	
<b>Total Investment</b>				\$947123	

## FOOTNOTES

- \* The higher utilisation of entitlement in 1987/88 is due to there being only two operative entitlement levels for the year compared with three in 1986/87, making flock management easier
- \*\* All costs except levies and fixed capital charges are assumed to be 2.5% higher in 1987/88, reflecting the rise in the Pig, Poultry and Other Farm Input price index between September quarters
- \*\*\* Interest on chick rearing costs is assumed to cover 50% of costs as older birds will be producing income
- \*\*\*\* Interest on laying costs is assumed to cover only 10% of total laying costs due to the fact that fortnightly payouts mean that most laying expenses can be met from cash income.
- \*\*\*\*\* Interest payments on fixed capital are based on the following assumptions:  
 From August 1978 to Dec 1986 the Farm Buildings component of the "Capital Expenditure Index" increased 2.5X  
 On this basis the value of land and buildings when the unit was established would be \$380,000  
 It was assumed that \$350,000 of this was debt financed, initially at 10% with a 20 year payback.  
 This, and rising interest rates gave the following repayment schedule

**Repayment Schedule for 1978 Loan of \$350,000**

<u>Year</u>	<u>Interest Rate</u>	<u>Annual Payment</u>	<u>Interest Component</u>	<u>Remaining Principal</u>
1978	0.1	41125	35000	343875
1979	0.1	41125	34388	337138
1980	0.11	43775	37085	330448
1981	0.12	46414	39654	323688
1982	0.13	49015	42079	316752
1983	0.14	51570	44345	309527
1984	0.15	54071	46429	301885
1985	0.17	58982	51320	294223
1986	0.19	62405	55902	287720
1987	0.17	59490	48912	277142

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## APPENDIX C

### DATA SOURCES AND TRANSFORMATIONS

#### Section 5.1.1 Producer Numbers

Number of entitlement holders: NZPB Annual Report, Table 1 (various years)  
Nominal Producer Payout Price: NZPB Annual Report, Table 12 (various years)  
Nominal Producer Price Index: Monthly Abstract of Statistics, Table 21.19  
Consumers Price Index: Monthly Abstract of Statistics, Table 21.01

#### Section 5.2 Entitlement Movements

Recommendations of Beck (et al, 1984), Table 1, "Relocation Priorities"  
NZPB (1984)

Transformation: Multiplied by 12,000 to put in terms of individual eggs  
Divided by 245 to put in terms of entitlements

Actual Changes from NZPB Newsletter, 8 April, 1987

Aggregation: The two sources noted above used different regional definitions necessitating the use of the following aggregations:  
Whakatane, Tauranga and Rotorua from NZPB combined  
Central Otago and Dunedin/South Otago from NZPB combined  
CHR and ASH (Christchurch and Ashburton) from Beck et al.  
combined.

#### Section 5.2.1 Explanatory Model

Regional Changes in Entitlement Holdings (Y) as for 'Actual Changes' above.  
Regional Population Growth Rate, New Zealand Yearbook (1982 and 1986)  
Excess Capacity on Farms, Tables 2 - 6, NZPB Annual Report (1979 to 1986)

#### Section 5.3.1 Retail Price

Nominal Egg Price Index: INFOS, Department of Statistics, Series CPIM.SE923A  
Nominal Producer Price Index: Monthly Abstract of Statistics, Table 21.18  
Consumers Price Index: Monthly Abstract of Statistics, Table 21.01

#### Section 5.4.1 Estimation of the Retail Demand Curve

Quarterly Sales of Eggs: NZPB Annual Report, Table 11 transformed by  
dividing by the weighted average of the NZ population in urban  
areas with marketing agents (NZ Official Yearbook).  
Real Disposable Income Index: Monthly Abstract of Statistics, Table 22.06  
Nominal Egg Prices: Department of Statistics, Series CPIM.SE923A, deflated  
by Food Price Index, Monthly Abstract of Statistics, Table 21.03



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