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The Distributional Implications for Higher Farm Animal Welfare in New Zealand

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Abstract

Over the past few decades the relative price of eggs has fallen dramatically in New Zealand. This has been made possible, at least in part, by the application of increasingly intensive agricultural practices. However, there is also growing pressure from consumers and animal rights groups around the world to ban the use of conventional/barren cages for egg production on animal welfare grounds. In this paper a simple partial equilibrium model is used to provide a preliminary estimate of the welfare effects of moving to alternative housing systems for egg laying hens in New Zealand. Results indicate that in a market where demand is relatively inelastic and trade is restricted for sanitary reasons, the cost of improving hen welfare will be born largely by consumers. This raises difficult distributional issues, as market research indicates that nearly 80% of the eggs currently sold in New Zealand supermarkets are cage eggs, and the heaviest purchasers of eggs are those with large families and limited budgets.

Introduction

Nearly 90% of the eggs currently produced in New Zealand are laid by hens housed in conventional cages. Conventional cages significantly reduce the cost of production, because they allow for the mechanisation of many labour-intensive activities and the strict control feeding and environmental factors. They are also associated with lower bird mortality because they reduce the hens' exposure to aggression and pathogens. One of the primary consumer benefits of increasingly intensive production in the egg industry has been a reduction in the relative price of eggs, and work by Statistics New Zealand demonstrates that the real price of eggs has fallen dramatically over the past 50 years (Statistics New Zealand).

However, there is a growing consensus that increasing economic welfare for consumers has come at the expense of declining welfare for animals. In New Zealand, the National Animal Welfare Advisory Committee (NAWAC) is currently reviewing the Code of Welfare, which sets out legally binding minimum standards for the welfare of layer hens. Among the minimum standards under consideration are those for housing, and NAWAC has signalled in the updated Draft Code (2011) that conventional cages do not represent an adequate minimum standard of welfare. Alternatives to conventional cages include enriched colony cage systems and a range of non-cage options. The Ministry of Agriculture and Forestry has conducted an economic analysis of transitioning from conventional cages to enriched colony systems (MAFBNZ, 2010), but to date no work has been done on the economic consequences of shifting to non-cage systems in New Zealand. The purpose of this preliminary research is to begin to fill this information gap.

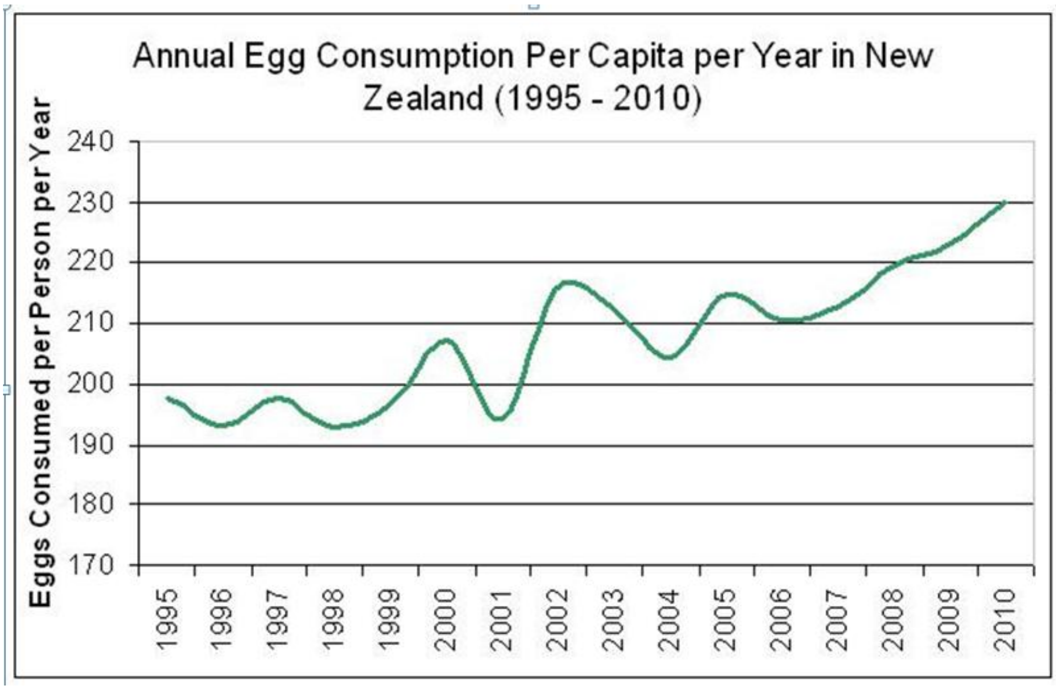
The primary non-cage alternative currently used in New Zealand is a deep-litter barn system, where hens are housed in a large shed with a litter floor. In these systems there are perches or other raised structures for the birds to sit and sleep on, and nest boxes are provided for the hens to lay their eggs in (Egg Producers Federation website). Although there are other non-cage systems available, this analysis will focus on barn systems. Alternative multi-tiered non-cage systems are not currently in use in New Zealand, and it is unlikely that a ban on conventional cages would prompt an industry-wide adoption of free range production. Available evidence suggests that the per-unit costs of free range production are higher than those of barn production, so the results presented here will represent a lower-bound for the cost of a ban on cages.

After briefly discussing egg consumption in New Zealand, this paper specifies a very simple partial equilibrium model that can be used to consider the economic cost of moving to non-cage housing. Parameter estimates from overseas are then combined with the limited amount of New Zealand-specific data that is available to obtain preliminary estimates of the farm-level price and quantity effects of moving to deep litter barn systems. A measure of the long run annual social cost of the transition is also provided. These results are followed by consideration of how the farm-level effects may influence the retail price of eggs, and what sort of impact the subsequent price increase will have on average egg expenditure in New Zealand. Finally, reflections on whether a move to non-cage housing is likely to be efficient from an economic view are offered. Whether cage production should be discontinued on ethical – as opposed to economic – grounds is not the subject of this paper. The paper does, however, begin to set up a framework for measuring the economic cost of such a move.

Egg consumption in New Zealand

Egg consumption in New Zealand has been trending upwards over the past 15 years (Figure 1). Eggs are an important source of high-quality protein, and New Zealand egg consumption is high by international standards. At 225 eggs per person per year, egg consumption was higher in New Zealand in 2008 than it was in Australia or the UK, but lower than it was the USA and considerably lower here than in Mexico, Japan or China. (Evans, 2009)

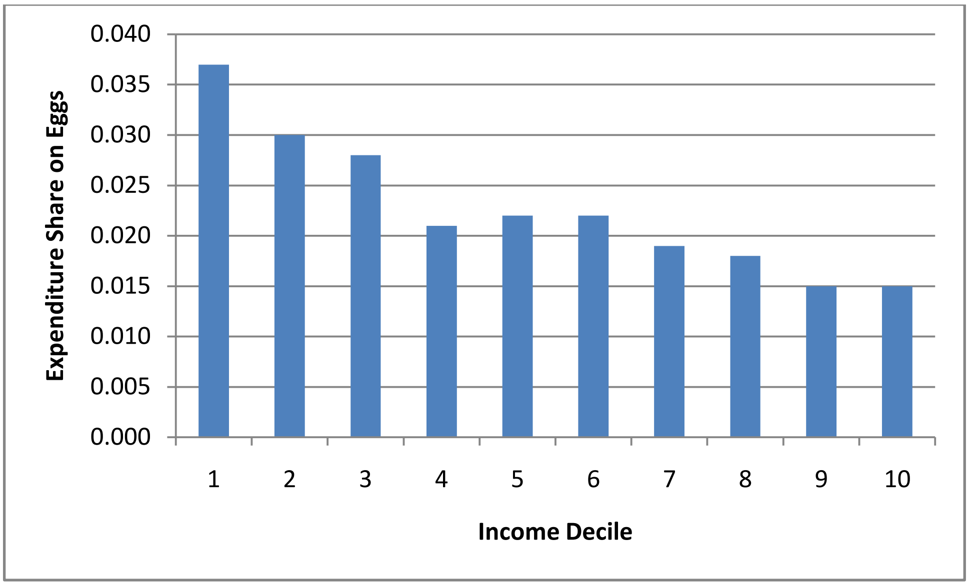
Figure 1 Annual Egg Consumption Per Capita



Source: New Zealand Egg Producers Federation website

According to results from the Statistics New Zealand Household Economic Survey, the average household spends $1.80 per week on eggs, with higher income households spending more on eggs each week in absolute terms than lower income households. However, when expressed as a 'budget share', households in the lower income deciles allocate more of their weekly food expenditure to eggs than households in the upper deciles (Figure 2).

Figure 2. Expenditure Share Spent on Eggs by Income Decile



Source: Statistics New Zealand, Household Economic Survey, 2009

Notes: Share is expressed as a percentage of total weekly expenditure on food, and includes only those who reported expenditure on eggs; differences in expenditure between lower and upper deciles are significant at a 5% level of significance.

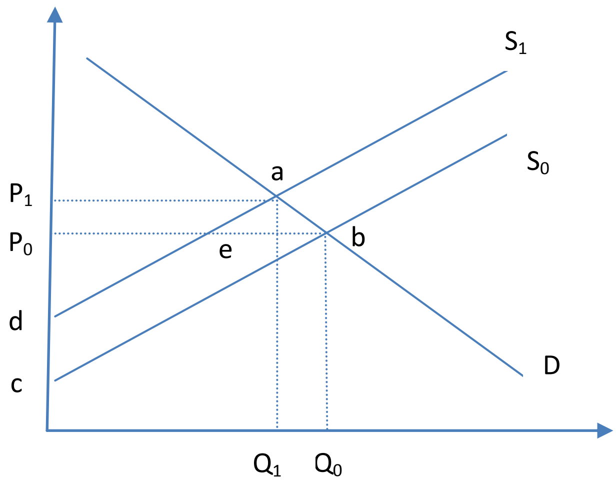
Market research supports the proposition that eggs may be a relatively more important source of protein for lower income consumers than they are for higher income consumers. A recent study conducted for the Egg Producers Federation (Southerland, 2010) clustered egg purchasers according to 'heavy' (1 ½ dozen eggs per week), 'moderate' (1 – 1 ½ dozen per week) or 'light' (less than 1 dozen per week) consumption. They found that heavy egg consumers are more likely to be of Maori, Pacific Island, or other non-European ethnicity, and have lower incomes and more children in the household.

Modelling the resource costs of animal welfare policy

In this section a very simple partial equilibrium model will be used to clarify how the social costs of animal welfare policies can be considered. The model will also help to identify the factors that are likely to influence the magnitude of the price effect and the distribution of the economic burden of policies that increase the cost of production.

The model is a very basic economic surplus model of the type that Alston, Norton and Pardey (1998) develop to calculate the benefits of agricultural research. The obvious difference is that research on alternative housing systems conducted in the EU and the USA indicates that moving to non-cage housing systems for hens will increase per-unit costs of production, whereas agricultural research is aimed at reducing production costs. Equations for price, quantity and surplus changes presented below have been modified to reflect a reduction, as opposed to an expansion in supply.

Figure 3 Direct impact of animal welfare policy



The move to non-cage housing systems for layer hens can be modelled as a shift the supply curve from S_0 to S_1 (Figure 3). Initial equilibrium occurs where S_0 = D, at a price and quantity of P_0 and Q_0, respectively. The impact of the policy is therefore to increase the price to P_1, and reduce the quantity traded to Q_1. The net annual social cost to society is the area dabc.

Assuming linear supply and demand curves, and a parallel shift in the supply curve, the following equations can be used to estimate the percentage changes in price and quantity, along with the total annual social cost of improving hen welfare (Alston, Norton and Pardey, 1998):

(1)

(2)

(3)

where:

k is the cost increase or vertical shift in the supply curve, expressed as a percentage

ε is the elasticity of supply

is the absolute value of the elasticity of demand

is the (annual) change in total surplus

Note that the price and quantity effects are fairly robust to assumptions governing the functional form of the supply and demand curves, but the total surplus estimate depends heavily on the nature of the supply shift (eg parallel or pivotal). The extent of the price effect, and therefore the economic burden of the farm animal welfare improvement, will depend critically on the size of the supply shift, and the relative elasticiities of supply and demand.

It is possible to enhance this model substantially by explicitly incorporating multiple levels along the supply chain and/or heterogeneous regions or producer groups, but this simple model represents a good starting point for enhancing our understanding of policy impacts. If values are calculated at the farm level, the loss in consumer surplus represents the aggregate cost to consumers of the animal product at all levels. How much of this price increase is actually transferred to increases at the retail level will depend upon elasticities of price transmission. An initial equilibrium is also required to estimate the total surplus loss.

Data

Cost of non-cage options

Industry research in New Zealand and overseas reveals that feed, labour and pullet costs are among the most significant variable costs for egg producers. Housing also represents a significant expense for producers, and must be considered in any long run analysis. Financial analysis of alternative housing systems conducted in the EU and the USA shows that these expenses are all higher for non-cage housing systems (Bell, 2005; Sumner, *et al.*, 2008, 2010 and 2011; Agra Consulting, 2004). Feed costs are higher per unit of output because feed consumption is greater in non-cage systems to compensate for more movement and less effective climate control. In addition labour use is higher in non-cage systems due to fewer hens per housing structure, additional labour requirements for egg gathering, and a generally lower level of mechanisation. Higher hen mortality in non-cage systems contributes to higher pullet costs per unit of output. Finally, marketable egg production is lower when cages are not used because total egg production is slightly lower and 'floor eggs' must be down-graded. Although non-cage operations are generally less capital intensive than conventional cage farms, when expressed on a per-bird or per unit of output basis, non-cage housing costs are also higher due to substantially lower stocking rates. Because of the greater space requirement per bird, and the fact that the most widely used non-cage options are single-tiered, non-cage systems also require additional land.

No empirical estimates of the cost premiums associated with non-cage housing systems have been calculated using New Zealand data, but the literature provides a range of estimates from studies conducted overseas. Work by a University of California poultry specialist in 2005 suggests that production costs in deep litter barn systems are 27% higher than conventional cage systems, and that free range production costs are nearly 70% higher than production costs using conventional cages (Bell, 2005). A study conducted in the EU suggests that the premiums associated with barn and free range production are approximately 24% and 48%, respectively (Agra Consulting, 2004). In a 2008 study on the economic impact of a California ballot initiative to restrict the use of cages for table egg production, data was collected from a sample of California farms that use both conventional cages and non-cage (deep litter barn) housing systems (Sumner, *et al.*, 2008). According to the summary of data presented in this report, the total cost premium associated with non-cage production ranges from 41% (when calculated using averages) to 70% (when calculated using data exclusively from low-cost producers).

For the purposes of this study, the proportional shift in the supply curve due to a move to non-cage floor systems will range from 0.25 to 0.6.

Elasticities of supply and demand

There are no empirical estimates of supply or demand elasticities for eggs in New Zealand. Basic economic theory would suggest that the demand for eggs at the retail level would be relatively inelastic, as eggs are an important source of protein with few ideal substitutes and they constitute a small proportion of the overall food budget for most consumers. Overseas studies confirm this hypothesis. Alston (1986) uses a demand elasticity of -0.3 to estimate the economic welfare effects of regulatory changes to the Victorian egg industry in Australia. This estimate was based on earlier econometric analysis using Australian data. Kastens and Brester (1996) compared estimates of the own-price elasticity of demand for eggs at the retail level in the USA obtained with three different demand systems approaches. Estimates ranged from approximately -0.1 to approximately -0.3. Yen et al (2003) use a systems approach to estimate demand elasticities for food stamp recipients in the USA. Their results also varied by model specification, and ranged between -0.59 and -0.66. Huang and Lin (2000) used data collected in the 1980s for a national food consumption survey in the USA to estimate a system of demand equations for food. With an estimated elasticity of -0.05, their results also indicate that the elasticity of demand for eggs at the retail level is highly inelastic.

For the purposes of this study, a retail level demand elasticity of -0.3 will be assumed. If a constant absolute mark-up is assumed from farm-gate to retail, the farm-level demand elasticity can be calculated by multiplying the retail demand elasticity by the farmers' share of the consumers' egg dollar (Alston, 1986). Given a retail demand elasticity of -0.3, an average retail price of approximately $3.00 for cage eggs and a farm gate price of $2.10, the elasticity of demand facing farmers is approximately -0.21.

There are very few estimates of the supply response for eggs in the published literature. In a study of the economic welfare effects of deregulation in the Australian egg industry, Alston (1986) uses a short run supply elasticity of 0.7, based on work done in the 1960s and 1970s. However, he notes that in the long run, supply is likely to be much more elastic as changes in the supply of eggs are unlikely to have much impact on factor input prices. Alston makes the observation that the long run supply response for table eggs may be similar to that of pork, as both industries are fairly capital intensive and can be expected to have broadly similar impacts on key input prices as output expands. Alston then cites Richardson and O'Connor (1978) who calculated a long run supply elasticity of 3.7 for the pork industry in Australia. More recent estimates of the long run supply elasticity for pork range from an inelastic value of approximately 0.3 for Greece (Rezitis and Stavropoulos (2009)) to a much more elastic value of nearly 4 for the Dutch pig industry (Kuiper and Meulenberg (1997). In a recent study of changes to layer hen housing requirements in California, Sumner, *et al*. (2010) note the on-going lack of reliable empirical estimates of long run supply response, and assume a long run supply elasticity ranging from 5 to 10.

For this preliminary analysis, a long run supply elasticity of 3 will be assumed. Sensitivity analysis indicates that results are robust to changes in the supply elasticity, but sensitive to assumptions about demand response and the magnitude of the supply shift.

Initial equilibrium

In 2009, there were approximately 72 million dozen eggs produced by hens housed in conventional cages in New Zealand, and average farm level price was $2.10 per dozen (MAFBNZ, 2010).

Results

Table 1. Estimated Price and Quantity Effects of Changes Increasing Minimum Standards for Layer Hen Housing in New Zealand.

Supply Shift	Price Effect (Percentage Change)	Quantity Effect (Percentage Change)	Total Annual Cost ($/year)
0.25	23.4	-4.9	$37 million
0.6	56	-12	$85 million

Notes: The farm level demand elasticity is assumed to be -0.21; the supply elasticity is assumed to be 3; the price, quantity and total annual cost estimates are reflective of linear supply and demand curves and a parallel shift in supply. Price and quantity effects are robust with respect to assumptions regarding functional form, but the total cost estimate is sensitive to assumptions made about functional form and the nature of the supply shift.

Results of the simple partial equilibrium model suggest that an industry-wide move to barn housing will increase farm level prices by 23 – 56%, depending on assumptions governing the extent of the supply shift (Table 1). Given the current market premium for barn eggs in New Zealand, it seems reasonable to expect price changes towards the upper end of this range. The long run price impact and total annual cost reported here for a move to barn systems are significantly higher than those reported by MAFBNZ for a move to colony cages (MAFBNZ, 2010), where long run price increases were estimated to range between 9 and 13%, and annual costs were estimated to be in the neighbourhood of $15 million. The significantly higher premium associated with barn production can be attributed to higher capital and variable costs per unit of output in barn versus colony systems.

We can use the estimated price and quantity effects to draw some conclusions about the wider market effects of a ban on conventional cages. The approximate percentage change in industry gross revenue is the sum of the changes in price and quantity (Sumner, *et al*., 2011). Farm level cost increases of 25% and 60% would therefore be expected to increase gross revenue for egg producers by 18.5% and 44%, respectively. However, because the price increase was brought about by a cost increase and quantity falls, net revenue will decline for egg producers (ibid). Given the relative labour intensity of non-cage production, the employment effects of a ban on conventional cages are likely to be strongly positive, with more labour being used per unit of output and only a small decrease in aggregate egg production.

Clearly a farm level price increase of this magnitude can be expected to increase the retail price of eggs, and will therefore have an impact on New Zealand households that consume table eggs. The price impact at the retail level of changes in the farm level price of eggs will depend upon the elasticity of price transmission between farm and retail prices. Once again, there are no empirical estimates of price transmission elasticities for New Zealand. Econometric work done in the USA in the 1980s suggests that the long run elasticity of farm-retail price transmission for butter is 0.706 (Kinnucan and Forker, 1987). A more recent study on poultry meat in South Africa suggests that the long run elasticity of farm-retail price transmission for chicken is approximately 1.2 (Mkhabela and

Nyhodo, 2011). Finally, a study using Chinese data spanning 1996 – 2000 estimated an elasticity of price transmission for eggs of approximately 0.8 (Liu et al, no date).

Assuming an elasticity of farm-retail price transmission for eggs of 0.8, the retail price effect is estimated to range from 18 – 45%, or from $0.55 - $1.45 per dozen. This translates into an average increase in weekly egg expenditure for each New Zealand household of approximately $0.33 for a 25% cost of production increase through to $0.90 for a 60% cost of production increase. Note that heavy egg consuming households that currently purchase cage eggs could face expenditure increases of over $2.00 per week, while households currently consuming cage free eggs would be likely to face price (and expenditure) decreases following a substantial increase in the supply of non-cage eggs.

Willingness to pay for non-cage eggs

Whether consumers are better off in an economic sense after an industry wide transition to non-cage production depends on how they feel about cage versus non-cage production. Survey and revealed preference approaches to gauging willingness to pay for more welfare friendly eggs in New Zealand produce conflicting results. A 2002 survey of 500 New Zealand adults commissioned by the SPCA indicates that 79% of the survey participants were prepared to pay 30 to 60% more for eggs if it meant that the hens no longer had to live in battery cages (New Zealand Herald, 2002). However, although the market share of non-cage eggs is growing in New Zealand, the majority of eggs sold in supermarkets are from hens kept in battery cages (Table 2). In other words, price-driven consumers choose to purchase cheaper cage eggs over clearly labelled alternatives.

Table 2. Supermarket Sales of Eggs in New Zealand

	Market Share	Average Retail Price	Premium over Cage Eggs
Cage	78.8%	$3.03	
Barn	13.6%	$5.30	75%
Free Range	5.4%	$6.42	112%
Organic	2.2%	$7.97	163%

Source: NZ Egg Producers Federation

The growing body of survey research conducted overseas sheds some additional light on the nature of consumer preferences towards welfare friendly production. One of the first attempts to value the benefits of farm animal welfare legislation in the economic literature was a paper by Bennett and Larson (1996), which used a non-random sample of university students to estimate willingness to pay for improved welfare for veal calves and layer hens. Their results suggest that university students were willing to pay an additional 18% for eggs following a legislative ban on battery cages.

A similar study was conducted in the UK, and reported in Bennett (1997) and Bennett and Blaney (2003). The objective of the UK survey was to assess people's preferences in Great Britain regarding legislation to ban the use of battery cages in egg production in the EU. Statistical results indicated that, on average, consumers were WTP a price premium of approximately 30% for a ban on battery cages. It was recognized by the author(s) that the estimates may be biased upwards because of the hypothetical nature of the survey, and because of self-selection bias associated with the low response rate. Once these sources of bias were accounted for, the average premium fell to between 6% (Bennett, 1997) and 8.5% (Bennett and Blaney (2003).

Several recent studies have employed more sophisticated econometric techniques which allow authors to explicitly test for the existence of heterogeneous preferences towards farm animal welfare. Within the context of pig welfare in Sweden, Liljenstolpe (2008) concludes that different consumers do value animal welfare differently. Her results also suggest that consumers care about food prices and food safety as well as animal welfare, and the potential for trade-offs among these attributes makes valuing animal welfare difficult. These results are consistent with the findings of Lusk and Norwood (2008), who explored consumers' attitudes towards farm animal welfare within a broader context of social issues. The majority of the consumers responding to their nationwide (USA) survey indicated that issues such as poverty, the US health care system, food safety and the environment were more pressing social problems for the vast majority of respondents than the well-being of farm animals. Results from Norwood and Lusk (2008) suggest that not only do different consumers place different values on animal welfare, not all welfare improvements are valued equally. More specifically, housing options that are perceived to be more 'natural' by survey respondents were valued more highly than housing options that represent an improvement over the status quo, but still involve confinement.

In summary, New Zealanders have reported in surveys that they are willing to pay a substantial premium for welfare friendly eggs, but given clearly labelled alternatives in supermarkets, they continue to purchase cheaper eggs laid by hens housed in conventional cages. Overseas research in the economics literature can help explain this apparent paradox. Not only are willingness to pay estimates influenced by survey design, premiums for improvements in animal welfare have been shown to vary across both individuals and the nature of the welfare improvement, and average WTP estimates appear to mask important preference heterogeneity. Individual WTP values calculated from choice experiments in Europe and the USA vary from negative (price discounts) to positive (price premiums). Survey results also indicate that people care about animal welfare, but when put within a wider context they care more about other social issues such as food prices and food safety, which are likely to be negatively correlated with welfare friendly practices.

What is clear from observing behaviour in New Zealand is the fact that only a minority of the population is willing to pay the current 75% premium for barn eggs. Whether they would be willing to pay a lower premium remains to be seen, although most survey research indicates that average WTP premia would not be adequate to cover the price effects of an industry-wide transition to barn production.

Economists have pointed out that the consumption of animal products may involve negative externalities if farmed animals are reared in a manner that compromises their welfare (McInerney (2004), Bennet (1997) and Carlsson *et al.* (2007)). If this is the case, then a ban on conventional cages may increase aggregate social welfare even if current cage egg consumers are not willing to pay the premium associated with non-cage production because of the value others place on liberating hens from cages.

Perhaps the first study designed explicitly to test for the existence of an externality in the market for animal products was reported in a recent paper by Carlsson, *et al.* (2007). Their objective was to determine whether people were willing to pay more for a ban on welfare unfriendly practices than they were for a voluntary labelling programme which would still allow the use of welfare unfriendly practices for those consumers who were not willing to pay a premium. Their results indicate that Swedish consumers are WTP a 30% premium for barn eggs when battery eggs are not available for others to purchase. The authors argued that the difference between the two WTP estimates represents the WTP for the 'public good' aspect of animal welfare. However, although there was a difference between the two estimates, it was not statistically significant. Because of the lack of statistical significance, they concluded that the evidence was not strong for a public good component to animal welfare.

The (albeit statistically insignificant) premium associated with a legislative ban on welfare unfriendly housing practices for hens in Sweden is at odds with an estimated ***discount*** calculated by researchers in the USA. Tonsor *et al.* (2009) developed a choice experiment to compare willingness to pay for a legislative ban on gestation crates with willingness to pay for welfare friendly pork purchased under a scheme involving clearly labelled products marketed by producers who voluntarily used alternative housing options for pregnant sows. Results suggest that the average willingness to pay for a ban on gestation crates was approximately 34¢ (a 10% premium), but that preferences were strongly heterogenious. Indiviual willingness to pay for a crate ban varied from negative (20% discount) to positive (50% premium), with only 20% of the respondents consistently placing a positive value on a ban. By contrast, average willingness to pay for crate-free meat under a voluntary labelling scheme was $2.10 (a 60% premium), and negative only for the 14% of respondents who were extremely price conscious. Consumers in the USA, it appears, place more value on freedom of choice than they do on the potential external effects of their meat consumption.

Most people would probably agree that intensive agricultural production practices that do not allow animals to express 'normal' patterns of behaviour create a negative externality. However, attempts to quantitatively measure the extent of the externality have produced conflicting results, and more empirical work is required to settle this theoretical question.

It would be possible to extend the simple partial equilibrium model slightly by incorporating a demand shift to represent an increased willingness to pay for non-cage eggs as in Sumner *et al.* (2011). The qualitative results reported above, however, would not change so long as the supply shift is larger than the demand shift. For a 10% increase in WTP, for example, the long run price increases a further 1%, and the quantity effect is moderated.

Upfront cost of moving to cage free housing

The elimination of conventional cages in New Zealand will require substantial capital investment from producers. This investment has been captured on an annualised basis in the vertical shift of the long run supply curve in the analysis above, where it was demonstrated that most of the economic burden of changes in housing requirements for hens will fall ultimately on the consumer. In this final section an estimate is provided of the magnitude of the initial 'up front' capital investment of transitioning to barn systems, a financial burden which is borne initially by producers.

While there is no published information available on the cost of constructing new barn facilities for layers in New Zealand, Nimmo-Bell (2010) provides is an estimate of $40/bird to construct a new conventional cage facility. When combined with an estimate of the housing cost premium associated with barn production from overseas, it is possible to obtain a rough indication of the capital costs of rehousing the New Zealand flock in barns.

Results from the UK indicate that the per-unit costs of housing layer hens vary significantly with stocking density (Compassion in World Farming, 2002). In general, however, because of the significantly lower stocking densities associated with non-cage systems, capital costs are higher in barn systems than they are in cage systems. Results from the EU indicate that per unit buildings and equipment costs are approximately 55% higher for barn systems than cages systems. Using data from the British Egg Industry Council, the Compassion in World Farming Trust (2002) shows that per-bird capital costs are approximately 40% higher in lower density barn systems than in conventional cage systems. Research conducted in the USA (Bell, 2005 and Sumner, *et al.*, 2008) indicates that the relative capital costs for barn systems might be higher than the European figures suggest. Both of these studies report that housing costs in barn systems are twice as high on a per-unit of output basis than housing costs for conventional cage systems.

Taken together, the above information suggests that construction costs for barn systems will range from $56 to over $80 per bird. Initial conversations with barn producers in New Zealand suggest that actual construction costs are likely to fall towards the upper end of this range. Taking an average of $68/bird for illustrative purposes, and a current caged population of approximately 2.9 million, construction costs are likely to be in the vicinity of $200 million. This does not recognize that it may be possible to retrofit some existing sheds at a lower per-bird cost, or the fact that producers will also face additional expenses associated with acquiring land and resource consents.

Conclusion

More intensive housing practices for layer hens have at least partly facilitated a dramatic reduction in the real price of eggs in New Zealand over the past 50 years. As a result, the per capita consumption of eggs has been increasing, and eggs are now an important source of high quality protein – particularly for low income households. However, producers around the world are under increasing pressure to abandon the use of conventional cages on animal welfare grounds. In New Zealand, the National Animal Welfare Advisory Committee has made it clear that conventional cages do not represent an adequate minimum standard of welfare. This paper has considered the cost and distributional implications of moving to non-cage egg production, with a focus on deep litter barn systems.

A simple partial equilibrium displacement model was specified to measure the magnitude and distribution of the cost of moving to more welfare friendly housing for the New Zealand laying flock. Results suggest that, in the very short run, a move to barn production will cost producers in the neighbourhood of $200 million. This is a relatively conservative estimate based on housing cost premiums calculated from overseas data, combined with estimates of housing costs for conventional cages in New Zealand. It does not include land or resource consent costs. In the longer term an inelastic demand for eggs, combined with higher per-unit production costs can be expected to drive the farm level price of eggs up by 23 – 56%, depending on the magnitude of the production cost premium.

The corresponding price impact in the retail market is likely to be significant, given available estimates for farm-retail elasticities of price transmission. A rough estimate of the price effect at the retail level is an additional $0.55 - $1.45 per dozen, which implies an average cost per household of $0.33 to $0.90 per week. Heavy egg consumers can be expected to pay more than the average, and current consumers of non-cage eggs may even pay less for their eggs as the supply of non-cage eggs increases significantly. Because heavy egg consumers are more likely to be of non-European descent, and because low income consumers allocate more of their weekly food expenditures to eggs, the price impact is likely to be felt more heavily by low-income households and those of Maori or Pacific Island ethnicity.

There is not enough empirical evidence on either the premium that New Zealand consumers may be willing to pay for welfare friendly eggs, or the possible existence or magnitude of an externality in the egg market to draw firm conclusions as to whether a move to barn production constitutes a potential Pareto improvement for New Zealand. The balance of the available evidence suggests that it may not be – as the price premium is higher than most average WTP estimates, and the empirical support from overseas studies for the existence of an externality is mixed. Note that there may be compelling ethical, as opposed to economic reasons to discontinue the use of cages in New Zealand. While this paper does not address this question directly, it does take a preliminary step towards providing an estimate of the social cost of such a move.

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