8 February 2011

Proposed CWH/WSI Merger - Cost Benefit Analysis

Bell Gully

NERA
Economic Consulting

Confidential
Prepared at Request of Counsel

Project Team

James Mellsop

Kevin Counsell

Will Taylor

NERA Economic Consulting
Level 18
151 Queen Street
PO Box 105 591
Auckland 1143
Tel: +64 9 373 7230
Fax: +64 9 373 7239
www.nera.com

Confidential
Prepared at Request of Counsel

Contents

1. Introduction

We have been asked by Bell Gully to quantify the benefits and detriments of a potential merger between the wool scouring businesses of Cavalier Wool Holdings Limited (CWH) and New Zealand Wool Services International Limited (WSI). For this purpose we have generally adopted the models used by the Commerce Commission in previous authorization decisions (we identify in the report where we have taken a different approach).

We have also carried out a critical loss analysis to assist in assessing the extent to which a price increase by the merged entity would be constrained by the entry/expansion of competing firms (whether domestic or overseas). This is useful in assessing the likely extent of any detriments.

For our analysis, we have been asked to adopt the Commission's market definitions from *Decision 666*, i.e.:

- The North Island market for the supply of wool scouring services;
- The South Island market for the supply of wool scouring services; and
- The national market for the purchase and supply of wool grease.

We have calculated benefits for New Zealand and detriments for each of the North and South Island scouring markets, and summed those detriments for New Zealand as a whole. Our analysis also incorporates (at least approximately) the expected change in wool grease market surplus, as wool grease is a by-product of scouring. We set out the benefits and detriments for New Zealand as a whole in the main body of our report, with the North and South Island detriments breakdown in the appendices.

Based on our analysis, the merger would result in a net benefit (in present value terms) to the New Zealand public. The range of possible net benefits is quite large. If we combine:

- The worst case detriments scenario (i.e., largest detriments) with the worst case benefits scenario (i.e., smallest benefits), then the net benefits would be $7.99 million (in present value terms); and
- The best case detriments scenario (i.e., smallest detriments) with the best case benefits scenario (i.e., largest benefits), then the net benefits would be $79.06 million (in present value terms).

In section 2 of our report, we quantify the benefits of the proposed merger. In section 3 we set out our critical loss analysis, and quantify the detriments.

We set out the net national benefits in section 4, with our conclusions. North and South Island breakdowns are contained in the appendices.

2. Benefits

2.1. Introduction

The merger would result in New Zealand scouring quantities being produced with fewer inputs. In particular:

- Scouring would occur at two sites rather than five (with one site being mothballed);
- There would be a substantial reduction in labour costs; and
- There would be a reduction in variable costs.

The merger would also result in improved wool scouring quality. We quantify these benefits in this section of our report, net of certain restructuring costs.

2.2. Productive Efficiency

2.2.1. Non-capital costs

CWH has created a model of fixed and variable operating and administrative expenditure under the factual and counterfactual. For present purposes we simply assume that the results of this model apply for each of the five years that we analyse. The CWH figures are set out in Table 2.1.[1]

[1] CWH provided us with its model, from which these figures are sourced, in a spreadsheet titled "Model Summary v2 (Status Quo vs Restrutured) v2 23-03-10.xls".

Table 2.1
National non-capital costs

Year	Counterfactual ($)	Factual ($)	Difference between factual and counterfactual ($)
1	[ ]	[ ]	[ ]
2	[ ]	[ ]	[ ]
3	[ ]	[ ]	[ ]
4	[ ]	[ ]	[ ]
5	[ ]	[ ]	[ ]
Total	[ ]	[ ]	[ ]
Present value[2]	[ ]	[ ]	[ ]

Note: numbers may not sum due to rounding.

Note that these cost figures are net of wool grease revenues. CWH believes that the wool grease yields on WSI counterfactual quantities will increase under the factual, resulting in factual wool grease quantity being greater than counterfactual wool grease quantity. The resulting surplus increase is (approximately) captured in the Table 2.1 figures.

2.2.2. Capital costs

It is important to note that the CWH model described above excludes the costs of the key assets, being land, buildings and plant.

We understand that the land and buildings are not specialized. The merger would mean that the land and buildings at Whakatu and Kaputone could be released as inputs into wool scouring, with immediate effect (we understand that the Clive site would be kept and mothballed). Applying the approach of the Commission in the *Ruapehu* case, this benefit can be measured by the expected sales price.[3] The current market values of these sites are set out in Table 2.2.[4]

---

2 Assuming a 10% discount rate.

3 In the *Ruapehu* authorization (*Decision 410*, 14 November 2000) the Commission estimated the benefits from the rationalization of off-mountain maintenance bases. The one-off benefits were calculated as the expected sales price from the sale of a maintenance base under the proposed acquisition, based on the Government valuation of the base.

4 Based on CWH estimates of market value (from information such as rateable value and comparable property sales), and sourced in a spreadsheet received from CWH titled "NetRestructuringCosts.xls".

Table 2.2
Current market value of land and buildings

Site	CWH estimate of market value ($)
Whakatu	[ ]
Kaputone	[ ]
Total	[ ]

We understand that additional capex is required on the buildings at Timaru and Awatoto, and this should be netted off from the productive efficiency benefits. We have assumed this expenditure is not sunk and have therefore calculated the present value of the cost of capital and depreciation[5] associated with this expenditure over a 5 year period. CWH has provided us with an estimate of $[ ]m additional capex at Timaru and $[ ]m additional capex at Awatoto.[6] The $[ ]m of expenditure at Timaru translates to a 5-year present value of $[ ]. The equivalent figures for Awatoto are an initial outlay of $[ ]m and a 5-year present value of $[ ].

The analysis of plant is different, because wool scouring plant is specialized, i.e., because there is no alternative use for it, its opportunity cost to society will be low compared to its replacement cost and book value. There will be a scrap value,[7] and in concept a cost of capital could be applied to this scrap value under both the factual and counterfactual, with the benefit being the lower cost of capital in the factual. However, it is our understanding that the same amount of plant will be used in the factual and the counterfactual, albeit that two of the lines will be mothballed. Accordingly there would not be much difference between the economic cost of *existing* plant in the factual and the counterfactual.

However, under both the factual and counterfactual there would be new capital expenditure on plant. Because these are forward-looking costs, they should be captured in the factual and counterfactual costs. Since factual capex on plant is less than counterfactual capex on plant, the result is a net benefit from cost savings on plant capex. See Table 2.3.

5 Using straight line depreciation and a 50 year asset life.

6 The source is a spreadsheet received from CWH titled "NetRestructuringCosts.xls".

7 For example, CWH estimates that the scrap value of the Kaputone and Whakatu plant would be $[ ]m in total.

Table 2.3
Expected future capital expenditure on plant[8]

Year	Counterfactual	Factual	Difference between factual and counterfactual
1	$[ ]	$[ ]	[ ]
2	$[ ]	$[ ]	[ ]
3	$[ ]	$[ ]	[ ]
4	$[ ]	$[ ]	[ ]
5	$[ ]	$[ ]	[ ]
Total	**$[ ]**	**$[ ]**	**[ ]**
Present value	**$[ ]**	**$[ ]**	**$0.88m**

Notes: CWH has on average spent approximately $[ ] per site per year (i.e., [ ]). We assume that this would continue under the counterfactual, and that because of its smaller operation, WSI would spend $[ ] across its two sites, leading to a total per annum figure of $[ ] under the counterfactual (for both winter maintenance and improvements in productivity/efficiencies). Under the factual, the merged entity would spend $[ ] in year 1, but partly because of this upfront investment, it would only spend [ ] per year from then on (for both winter maintenance and improvements in productivity/efficiencies).

For the purposes of our analysis, we assume that the capital expenditures on plant will be sunk.

2.2.3. One-off rationalisation costs

We understand that CWH is expecting to pay redundancy costs of $[ ] and contingency rationalization costs of $[ ] in the first year of factual. To be conservative, we treat these as social costs.

2.3. Quality Improvements

We understand that, post merger, it would be profit maximising for the merged entity to invest in its buildings in order to consolidate its scouring sites from five to two, and to invest in its plant in order to increase throughput of the Awatoto scour lines and the WSI scour lines. As well as enabling the merged entity to scour a greater volume of wool and reduce unit costs, that investment would also result in a higher quality output.

In particular, the investments in the plant to improve the scouring process would result in the wool becoming "whiter" or "brighter". All else being equal, a scouring service that creates whiter/brighter wool is more valuable to merchants. This might be because merchants would

[8] Note that the year 1 $[ ] factual expenditure would be split between Timaru ([ ]) and Awatoto ([ ]). We assume that the other factual expenditures in Table 2.3 would be split equally between the North and South Islands.

be able to sell the scoured wool for a higher price, or (more likely in the view of CWH) because merchants would be able to blend less white/bright (and therefore cheaper) greasy wool as an input while maintaining the same level of whiteness and brightness of the scoured output.

The extent to which the price of wool is higher as a result of improved brightness has been estimated in various studies using multiple regression analysis. These studies estimate the price premiums obtained at auction for various characteristics of wool, including brightness (Y):

- A study by Maddever (1994)[9] estimated that, using auction data from 1984 to 1993, a unit increase in the value of Y increased the price of clean wool by 6.2 cents per kilogram. For the 1992/93 season only, Maddever estimated a premium of 5.9 cents per clean kilogram;

- A study by Sumner, McDermott and Cox (2008) using data from 2003 to 2007 estimated a price premium for a unit increase in the Y value of strong wool of 2.5 cents per clean kilogram;[10]

- The most recent study is that of Aryal et al (2009), who estimated a price premium for a unit increase in the Y value of 3.52 cents per clean kilogram.[11] While Aryal et al state that they use New Zealand auction data, they do not state the years from which their data are drawn.

There are various ways to conceptualise and quantify the benefit of higher quality wool scouring. We have previously demonstrated, and the Commission has accepted, that the surplus effects of a transaction can be (tractably) analysed in any one of the markets in the relevant vertical chain.[12] Because it is most consistent with the remainder of our benefit and detriment analysis, we have quantified the surplus change in the scouring market. However, this does not necessarily mean that the incidence of the benefit will be as used in our analysis. While our analysis depicts a scouring price rise, in actual fact the benefit could end up distributed across growers, merchants, and the merged entity.

Post-merger, a merchant would be able to purchase lower grade wool from growers while still maintaining the same quality and therefore price per bale to (generally overseas) buyers. Accordingly the merchant would enjoy an input cost saving and a higher margin. As noted,

---

9 D C Maddever (1994), "Analysis of NZWB Wool Auction Data 1992/93", *WRONZ Confidential Report No. CFR 94/007.*

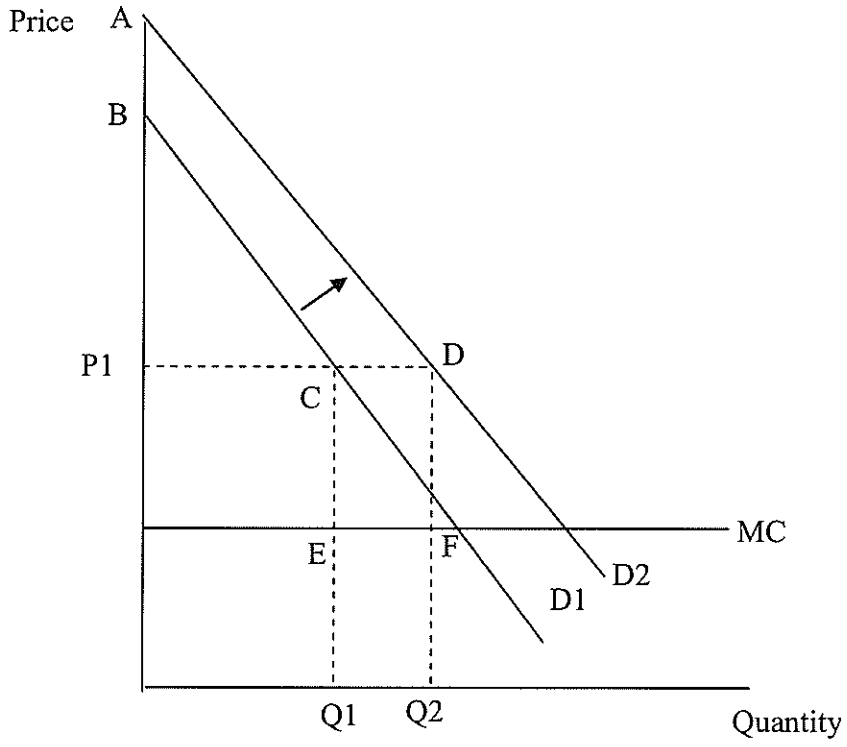
10 R.M.W Sumner, A.K. McDermott and N. R. Cox (2008), "Relative Economic Value of Wool Processing Parameters for New Zealand Strong Wool Between 2003 and 2007", *Proceedings of the New Zealand Society of Animal Production*, 68, 53-56.

11 J. Aryal, D. Kulasiri, G.A. Carnaby, and S. Samarsinghe (2009), "Investigating the Price of the New Zealand Wool Clip Using Modelling Approaches", Paper presented at the 18th World IMACS/MODSIM Congress, Cairns, Australia, 13-17 July.

12 See our report written while we were at Charles River Associates: "Coordinated Marketing of Pohokura Gas – An Economic Analysis", 20 December 2002, and the Commission's *Decision 505.*

the incidence of this benefit may be shared between the grower, scourer and merchant, but for quantification purposes we focus on the scouring market. The merchant would be willing to pay the scourer up to 1.9-4.7 cpkg (greasy) for that higher margin (equivalent to 2.5-6.2 cpkg clean). Accordingly the demand curve for wool scouring services would shift upwards by 1.9-4.7 cpkg. This is illustrated in Figure 2.1: the demand curve shifts out from D1 to D2, and quantity increases from Q1 to Q2. The additional consumer and producer surplus is given by the area ABCEFD.

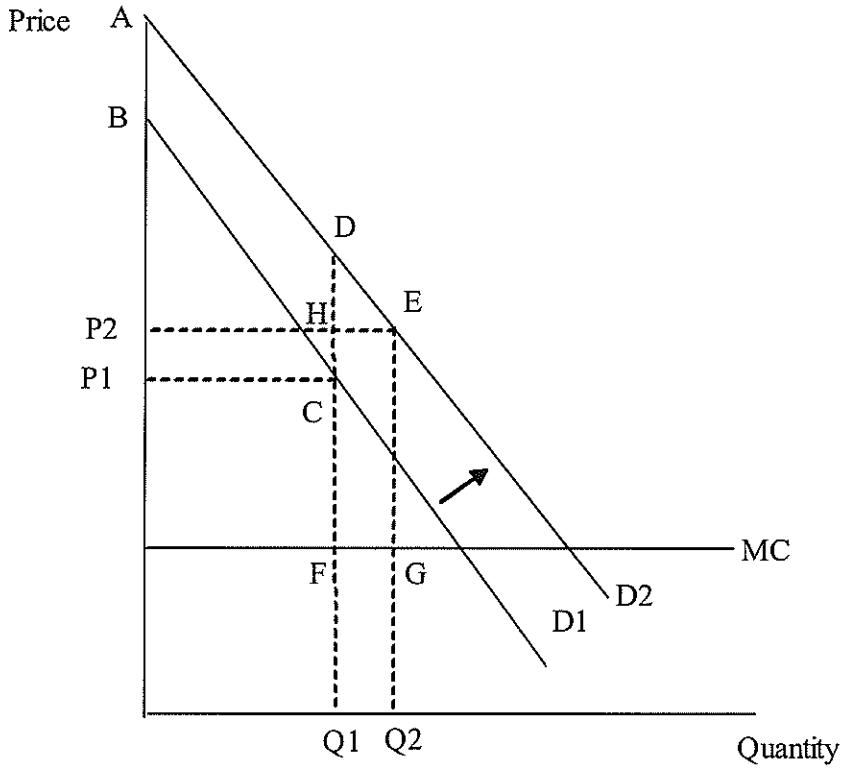
Figure 2.1
Illustration of benefits from quality improvements



In effect, this is the same model as the Commission uses to estimate dynamic inefficiency (as we describe in section 3 of this report), except that we push the demand curve upwards rather than downwards.[13] Technically this approach would overestimate the quality benefits, as it assumes that price is unchanged, when in reality we would expect a shift upwards in the demand curve to result in a price increase (all else being equal). To account for this we have assumed that the price increases by half of the shift in the demand curve (i.e. 0.5*(A-B) in Figure 2.1) – this is a slight adaptation to the Commission's model. This is illustrated in Figure 2.2 below where the quality benefit is represented by the area ABCFGED.

[13] The Commission also used this model in the *Ruapehu* authorization to quantify an expected reduction in quality. Consistent with the Commission's approach in that case, we assume a linear demand curve and constant marginal costs.

Figure 2.2
Illustration of benefits from quality improvements with price rise



There are two separate parts to the quality increase and therefore we have modeled a two-step increase in quality.

First, we model all of WSI's pre-merger scoured volumes (i.e., North and South Island) as being subject to a one unit Y uplift post-merger (holding all else constant). We refer to this as the "WSI Y benefit".

Secondly, we model a further one unit Y uplift for WSI's North Island volumes, and a one unit Y uplift for CWH's North Island volumes (in both cases holding all else constant). We refer to this as the "further Y benefit".

The result of this exercise on a national basis is shown in Table 2.4.[14]

[14] Our calculation requires data on pre-merger prices, quantities and costs. We source this data from a spreadsheet provided by CWH titled "Model Summary v2 (Status Quo vs Restrutured) v2 23-03-10.xls".

Table 2.4
Quality Benefits ($ per year)

Demand elasticity	WSI Y Benefit		Further Y Benefit	
-0.5	[	]	[	]
-1	[	]	[	]
-2	[	]	[	]
-3	[	]	[	]

3. Detriments

3.1. Introduction

We start this section by setting out a critical loss analysis. This assists in assessing the extent to which a price increase by the merged entity would be constrained by the entry/expansion of competing firms (whether domestic or overseas). It is also useful in assessing the likely extent of any detriments.

We then calculate allocative, productive and dynamic efficiency detriments, generally adopting the Commission's framework (with the exception noted in section 3.5 below).

3.2. Critical Loss Analysis

In this section we undertake a critical loss analysis to assist in assessing the extent to which a price increase by the merged entity would be constrained by the entry/expansion of competing firms (whether domestic or overseas). This is useful in ascertaining the likely extent of any detriments.

If the merged entity were to raise prices its profits would change in two offsetting ways:

- Profits would decrease due to the loss of volume, e.g., to rival firms; and
- Profits would increase due to the additional margin earned on volumes that remain with the merged entity.

If the latter effect dominates, then a post-merger price increase would be profitable to the merged entity. Critical loss analysis is a technique used to estimate the fraction of the merged entity's sales that would need to be lost in order to make an attempted price increase unprofitable (the "critical loss").

The equation generally used to calculate the critical loss is as follows:

$$\text{Critical loss} = \left[\frac{ssnip}{ssnip + gm}\right]100$$

where the *ssnip* is a particular post-merger price increase (often taken to be 5%), and *gm* is the post-merger gross margin:

$$gm = \frac{p - c}{p}$$

where p is price and c is marginal cost (which can be proxied by the post-merger average variable cost).

For the purposes of critical loss analysis and the remainder of our analysis, the allocation of costs between variable and fixed may be different to that adopted for internal management purposes. The question being tested is whether the merged entity could raise its price by 5-10% and sustain that price increase profitably for about a year. Any attempt by the merged entity to raise its price by this much would reduce quantity demanded and supplied in the market. So the ultimate question is, if quantity was to drop from Q_{cf} (being the counterfactual quantity) to Q_f (being the factual quantity) over the period of a year, what costs could the merged entity avoid?

It follows from this framework that the timeframe for considering which costs are fixed and which are variable should be one year. Using this framework, CWH has provided us with predicted variable and fixed cost data for the merged entity.[15]

[

]

For our analysis we have used the pre-merger price of CWH, and CWH's estimate of the variable costs for the merged entity ([ ]).[18] This results in gross margins of [ ]% in the North Island and [ ]% in the South Island Note that we have deducted from the variable costs the expected revenue the merged entity would obtain from selling the wool grease by-product. In effect, the production of a valuable by-product reduces the marginal costs the merged entity would

---

15 In a spreadsheet titled "CriticalLoss.xls". Note that we have updated this spreadsheet to pull in the figures from the most recent version of CWH's model "Model Summary v2 (Status Quo vs Restrutured) v2 23-03-10.xls"

16 [

]

17 [

]

18 Being average price per kg of [ ] in the North Island and [ ] in the South Island and an estimated (post-merger) average variable cost of [ ] in the North Island and [ ] in the South Island.

face in providing scouring services. The effect of this expected revenue is to increase the scouring gross margin.

The critical loss based on these gross margins and various assumed price increases is shown in Table 3.1. To explain these results, consider the following examples. If the merged entity raised price by 5% in the North Island, and actually lost more than [ ] of North Island sales, then the price increase would be unprofitable. On the other hand, if the merged entity raised price by 5% and lost less than [ ] of its sales, then the price increase would be profitable.

We have also estimated the critical volumes, and these are also set out in Table 3.1. To do this we have taken the joint production (in kgs) of CWH and WSI (as estimated by CWH) of [ ] bales in the North Island and [ ] in the South Island and used a conversion factor of 165 kgs per bale. [

] Using the estimated post-merger margins we applied the percentage critical loss to determine the critical volume. To use the North Island as an example, a [ ] critical loss equates to a critical volume of [ ] kgs. Using the 5% price increase as an example again, if the merged entity raised price by 5% in the North Island and lost sales equivalent to [ ] kgs per annum then the price increase would be unprofitable, while if it lost sales equivalent to (say) [ ] kgs per annum the price increase would be profitable.

Table 3.1 also shows the critical elasticity. This is the price elasticity of (residual) demand at which the merged firm's actual loss would be equal to its critical loss. For example, with a 5% price increase in the North Island, the actual loss will equal the critical loss if the elasticity of demand is [ ]. If the elasticity of demand is greater than this in magnitude ([ ]), the actual loss will exceed the critical loss and a 5% price increase will be unprofitable.

Table 3.1
Critical Loss Calculations

	North Island			South Island		
SSNIP	Critical loss	Critical volume (kg)	Critical elasticity	Critical loss	Critical volume (kg)	Critical elasticity
1%	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
2.5%	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
4%	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
5%	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
7.5%	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
10%	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]

To put the critical volumes into perspective, in the North Island CWH has [ ] customers who each scoured more than [ ] kg (being approximately the 5% critical loss level)[19] and an additional [ ] customers who scoured over [ ] kg[20] for the year ending 30 June 2010.[21] Therefore a 5% price increase in the North Island would be unprofitable if [ ] customers with over [ ] kg each switched to a rival.

The residual demand elasticity of a particular firm is a function of, among other things, the elasticity of supply of the firm's competitors. The elasticity of supply describes how much the quantity supplied changes in response to price changes. Therefore if the elasticity of supply is quite large, any attempt to raise prices by the merged entity would result in a large increase in supply by competitors and therefore a corresponding decrease in the residual demand faced by the firm.

At this point we do not have the data to empirically estimate the residual demand curve facing the merged entity. In this instance, the elasticity of residual demand would depend on the scope for domestic entry (which the Commission has previously regarded as likely in the event of a price increase) and the economics of scouring wool in China and the levels of excess capacity in China. If a small price increase would prompt domestic entry and/or make scouring in China profitable (and assuming there is sufficient spare capacity in China), then

---

19 Being [ ]

20 Being [ ]

21 We understand that there is little in the way of price discrimination in the scouring market at the moment. This suggests that there are features of the market that make price discrimination unprofitable or impractical, and it is not clear why this should change if the merger goes ahead.

residual demand is likely to be quite elastic and thus even a small price increase would be unprofitable.

A key conclusion to take from this analysis is that, because of its high gross margins (magnified by the wool grease revenue), the merged entity is likely to be sensitive to volume losses.

3.3. Allocative inefficiency

3.3.1. Explanation

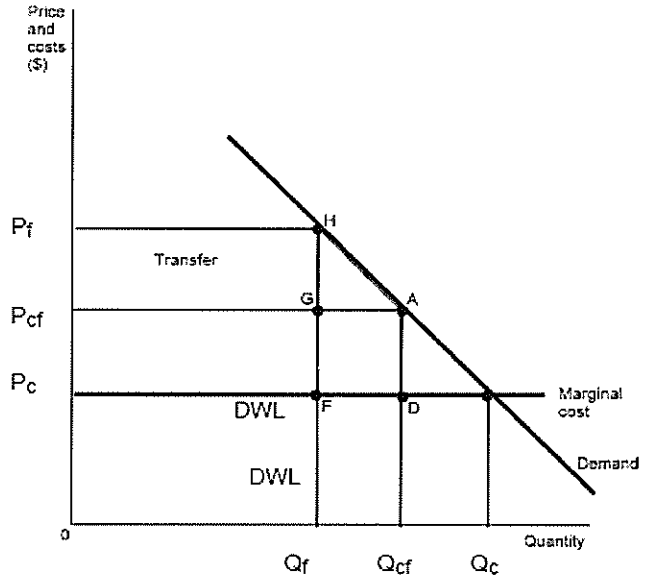
In the Air NZ/Qantas Authorisation ("Air NZ/Qantas"), the Commission described allocative inefficiency in the following manner:[22]

> *The impact of reduced competition—or, in other words, of increased market power— is generally to cause the market price to be increased further above, and market output to be reduced further below, the level which prevailed prior to the introduction of a proposed merger or set of arrangements*

In economics this situation is described as an increase in the "deadweight loss". Deadweight loss is surplus that is available to society (firms and consumers) but is not achieved because prices are above the competitive (equivalently, the allocatively efficient) level. This concept is illustrated graphically in Figure 4 of *Air NZ/Qantas* reproduced below.

[22] Para 902, *Air NZ/Qantas.*

Figure 4
The Basic Model of Allocative Inefficiency



In this graph the shaded area (HGFDA) represents the deadweight loss. The *f* subscript denotes prices and quantities in the factual (with the merger), the *cf* subscript denotes those in the counterfactual (without the merger) and the *c* subscripts denote the competitive price and quantity. Here the merger leads to prices increasing from P_{cf} to P_f, and quantity decreasing from Q_{cf} to Q_f. The increase in price leads to a loss of consumer surplus (which is measured by the area above price and below the demand curve) and a loss of producer surplus (the area below price and above the marginal cost curve). In this simple case, the deadweight loss (allocative inefficiency) resulting from the merger can be calculated as:

$$DWL = (0.5 \times \Delta P \times \Delta Q) + (GM_{cf} \times \Delta Q) \qquad (1)$$

The term in the first brackets represent the loss of consumer surplus, and is given by the triangle HGA. The term in the second brackets represent the loss in producer surplus, and is given by the square GFDA. Note that the merger also leads to some consumer surplus being transferred to producers (the rectangle marked "Transfer" in the graph), but such transfers are not part of the deadweight loss. The variables in equation (1) are defined as follows:

$$\Delta P = P_f - P_{cf} \qquad \textit{(price change)}$$

$$\Delta Q = Q_f - Q_{cf} = \frac{\varepsilon \times Q_{cf} \times \Delta P}{P_{cf}} \qquad \textit{(quantity change)}$$

$$\varepsilon = \frac{\Delta Q}{\Delta P}\frac{P_{cf}}{Q_{cf}} \qquad \textit{(price elasticity of demand)}$$

$$GM_{cf} = P_{cf} - MC \qquad \textit{(pre-merger gross margin)}$$

3.3.2. Data

CWH has provided us with the following data,[23] which is used as an input into our detriment calculations:

- [ ];
- Average pre-merger market price [ ] cents/kg in the North Island and [ ] cents/kg in the South Island. We understand that this is only CWH's price. However we use this as a proxy for the overall market price. CWH's view is that this is a reasonable proxy given only a small proportion of WSI's business is commission scouring. This price is calculated using revenue from the CWH accounting categories "scour (net)", "bleach & additives", "other" and "press". Note that wool grease revenue is not included as part of the "price" of scouring, but is instead netted off when calculating marginal cost given it is a byproduct that is sold separately;
- Pre-merger total market quantity: for the North Island the 2009/10 quantity was [ ] bales, while for the South Island it was [ ] bales. In addition, we are advised that each bale weighs 165kg, and so we have used this to convert the number of bales to kilogram quantities; and
- Variable cost [ ]: the (pre-merger) average variable cost (net of wool grease revenue) is [ ] cents/kg for the North Island and [ ] cents/kg for the South Island. As with price, we assume that this is a proxy for the overall market average variable cost.

Based on this data, the total variable cost for New Zealand [ ] is [ ][25] while the total revenue is [ ]

3.3.3. Results

We have estimated the allocative inefficiency detriment arising from the proposed merger across a range of assumed price increases and elasticities. The combined national result is shown in Table 3.2. Our critical loss analysis indicates that any price rise would not be

---

23 Data is sourced from spreadsheets titled "Model Summary v2 (Status Quo vs Restrutured) v2 23-03-10.xls" "NetTradeTariff-WSI 01-04-10.xls" and "Changes 25-01-11 to original models.xls". As mentioned earlier, variable costs are estimated using the CWH spreadsheet titled "CriticalLoss.xls".

24 [ ]

25 With wool grease netted off.

profitable for residual demand elasticities of greater than [ ] in the North Island and] in the South Island. Therefore, while we have included results for elasticities of [ ] in Table 3.2 for illustrative purposes, the allocative detriment is set to zero for these elasticities when calculating net benefits/detriments in section 4.

Table 3.2
National Allocative Inefficiency Detriments ($ per year)

	Demand elasticity			
Price increase	-0.5	-1	-2	-3
1%	-164,649	-329,299	-658,597	-987,896
5%	-846,854	-1,693,708	-3,387,416	-5,081,125
10%	-1,752,727	-3,505,454	-7,010,907	-10,516,361

It is important to note the following:

- Any post-merger price increases would be mitigated by the expected variable cost reductions, discussed in section 2.2 of our report; and
- These allocative inefficiency calculations (approximately) incorporate the surplus loss due to the decreased production of the wool grease by-product. This is because we have treated wool grease revenue as an offset to the marginal cost of scouring wool. This has the effect of increasing surplus in the wool scouring market, and correspondingly increasing the surplus loss when there is a price increase for wool scouring services.

When we pull together the benefit and detriment analysis in section 4 of our report, we assume that the allocative efficiency detriments set out in Table 3.2 occur in each of the five years that we analyse.

3.4. Productive inefficiency

3.4.1. Explanation

Productive efficiency refers to efficiency in internal firm production. A monopoly producer is normally considered to lack the competitive pressures to be efficient. Hence a 2-to-1 merger would be considered to yield productive efficiency losses (although the merged entity in the present case would still be subject to the threat of New Zealand entry and pressure from lower cost Chinese scourers). In Air NZ/Qantas, the Commission described productive inefficiency as follows:

> *Productive inefficiency measures the extent to which a business's costs are above the minimum necessary to produce a given output. This loss is real in the sense that resources are being wasted that could be used elsewhere in the economy to produce valued outputs, which are foregone because of their unproductive use by the inefficient firm. The excess costs are treated as a welfare loss.*

The Commission typically estimates productive efficiency losses by assuming that the merged firm's costs will increase. It does this by applying a factor (usually somewhere between 1-10%) to the pre-merger variable costs. This yields the increase in costs resulting from the merger or, equivalently, the productive efficiency losses.

We have estimated the productive inefficiency detriments by applying a percentage factor to the dollar value of pre-merger variable costs. [ ] The Commission has used various factors in the past for this calculation, such as 1%-5% in the Air NZ/Qantas authorization and 5-10% in the "newco" dairy cooperative merger.[26] We have calculated productive inefficiency detriments across various factors, with the results shown in Table 3.3.

Table 3.3
National Productive Inefficiency Detriments ($ per year)

Productive inefficiency factor	National Detriment
1%	[ ]
5%	[ ]
10%	[ ]

When we pull together the detriment and benefit analysis in section 4 of our report, we assume that the productive efficiency detriments set out in Table 3.3 occur in each of the five years that we analyse.

3.5. Dynamic inefficiency

The Commission describes dynamic efficiency in *Air NZ/Qantas* as follows:[27]

> *Dynamic inefficiency arises when a business or industry is less innovative than it might be. Innovations bring benefits to consumers either through the introduction of improved new products that buyers value more highly ("product innovations"), or through the use of new, lower cost ways of producing existing products ("process innovations")*

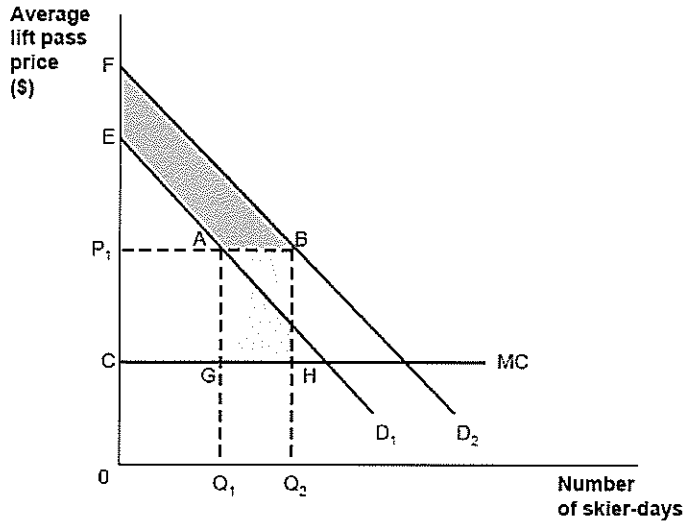
This is typically modelled by the Commission as a reduction in demand (product innovations) or an increase in cost (process innovations) relative to the counterfactual (without the merger). The demand contraction (or equivalently, expansion) point is illustrated graphically in Figure 3 of *Ruapehu* reproduced below.

---

26 Commerce Commission, New Zealand Dairy Board Draft Determination, 27 August 1999.

27 Para 42, *Air NZ/Qantas*.

FIGURE 3
A Model of Potential Dynamic Efficiency Gains and Losses



Thus calculating the dynamic efficiency loss from reduced product innovations would involve calculating the shaded area EFBHGA. To do so would require the same information as for allocative inefficiency (price, quantity, marginal cost and elasticity estimates or assumptions)[28], as well as an assumption about how much demand would be contracted. In *Ruapehu* the Commission examined the range of the detriment for various levels of lost demand growth (0.5%, 1% and 1.5%).

The above approach only takes into account product innovations. In *Air NZ/Qantas* the Commission adopted a simpler method to try and account for both process and product innovations. There the Commission calculated the loss in "general dynamic efficiency" by multiplying total revenue by a factor 0.5%-1%.[29] For a "back of the envelope calculation" this approach will be the easiest to implement as the only information required is total industry revenue.

The results of using the Commission's approach in *Air NZ/Qantas* of calculating the loss in "general dynamic efficiency" by multiplying total revenue [
] by a factor 0.5%-1.5% are shown in Table 3.4.

[28] [
]

[29] Para 1181 of *Qantas/Air NZ.*

Table 3.4
National General Dynamic Inefficiency Detriments ($ per year)

Dynamic inefficiency factor	National Detriment
0.5%	[ ]
1%	[ ]
1.5%	[ ]

While the Commission was of the view in *Air NZ/Qantas* that its approach captures dynamic inefficiencies from both reductions in demand (product innovations) and increases in cost (process innovations). However, to be conservative we have separately estimated the dynamic inefficiency detriments for a reduction in demand, assuming different elasticities and assumed shifts in the demand curve. The national results are shown in Table 3.5.

The Commission's approach did not include a price effect as a result of demand changes. For example as demand falls (as is assumed), we would expect price to fall. We have therefore adapted (improved) the Commission's model to include such a price effect, because as demand changes, we would expect price to change as well. We explain this further below in respect of the quality benefits.

Table 3.5
National Dynamic Inefficiency Detriments from Reduction in Demand ($ per year)

	Demand elasticity			
Assumed demand shift	-0.5	-1	-2	-3
0.5%	-608,542	-348,498	-218,476	-175,135
1%	-1,219,032	-697,969	-437,438	-350,595
1.5%	-1,831,467	-1,048,414	-656,888	-526,379

When we pull together detriments and benefits in section 4 of our report, we add the two dynamic inefficiency calculations together (i.e., the results in Table 3.4 and Table 3.5). We also assume that these calculations occur in each of the five years that we analyse.

4. Net Benefits and Conclusion

In Table 4.1 we bring together the benefits and detriments analysis, to obtain the net benefits of the proposed merger. Our analysis is carried out over a five-year timeframe following the merger, and we discount to obtain present values, using a 10% discount rate.[30]

We are advised by CWH that the benefits of the merger will begin accruing in the first year.

As noted in section 3, based on our critical loss analysis, it would not be profitable to increase prices if the residual demand elasticity facing the merged entity is greater than [ ] in the North Island or [ ] in the South Island (due to the very large gross margins, and therefore profitability sensitivity to volume changes). We have therefore set the allocative detriment equal to 0 for these elasticities when calculating net benefits/detriments.

Table 4.1
National Summary

demand elasticity	-0.5	-1	-2	-3
Detriments ($m PV)				
Allocative	(0.70) – (7.41)	(1.39) – (14.82)	0.00	0.00
Productive	[ ]	[ ]	[ ]	[ ]
Dynamic	[ ]	[ ]	[ ]	[ ]
Total Detriments 5 year PV ($m)	**(5.53) – (30.48)**	**(5.15) – (34.62)**	**(3.21) – (18.17)**	**(3.03) – (17.36)**
Benefits ($m PV)				
Non-capital cost savings	[ ]	[ ]	[ ]	[ ]
Land and buildings cost savings	[ ]	[ ]	[ ]	[ ]
Plant cost savings	0.88	0.88	0.88	0.88
Further Y quality benefits	[ ]	[ ]	[ ]	[ ]
WSI Y quality benefits	[ ]	[ ]	[ ]	[ ]
Capex on buildings	[ ]	[ ]	[ ]	[ ]
Redundancy	[ ]	[ ]	[ ]	[ ]
Total Benefits 5 year PV ($m)	**40.84 - 58.69**	**42.61 – 63.37**	**46.17 – 72.73**	**49.72 – 82.09**
Net Benefits 5 year NPV ($m)	**10.35 - 53.16**	**7.99 – 58.23**	**27.99 – 68.52**	**32.09 – 79.06**

[30] Note that we have not inflated any of the detriments or benefits.

Appendix A. Disaggregated Detriments Analysis

A.1. Allocative inefficiency

Table A.1
North Island Allocative Inefficiency Detriments ($ per year)

	Demand elasticity			
Price increase	-0.5	-1	-2	-3
1%	-81,881	-163,761	-327,522	-491,283
5%	-421,348	-842,696	-1,685,391	-2,528,087
10%	-872,558	-1,745,117	-3,490,233	-5,235,350

Table A.2
South Island Allocative Inefficiency Detriments ($ per year)

	Demand elasticity			
Price increase	-0.5	-1	-2	-3
1%	-82,769	-165,538	-331,075	-496,613
5%	-425,506	-851,013	-1,702,025	-2,553,038
10%	-880,169	-1,760,337	-3,520,674	-5,281,011

A.2. Productive inefficiency

Table A.5
Productive Inefficiency Detriments ($ per year)

Productive inefficiency factor	**North Island**	**South Island**
1%	[ ]	[ ]
5%	[ ]	[ ]
10%	[ ]	[ ]

A.3. Dynamic inefficiency

Table A.6
General Dynamic Inefficiency Detriments ($ per year)

Dynamic inefficiency factor	**North Island**	**South Island**
0.5%	[ ]	[ ]
1%	[ ]	[ ]

1.5%	[ ]	[ ]

Table A.7
North Island Dynamic Inefficiency Detriments from Reduction in Demand
($ per year)

	Demand elasticity			
Assumed demand shift	-0.5	-1	-2	-3
0.5%	-319,691	-182,718	-114,231	-91,402
1%	-640,407	-365,948	-228,718	-182,975
1.5%	-962,149	-549,691	-343,461	-274,718

Table A.8
South Island Dynamic Inefficiency Detriments from Reduction in Demand
($ per year)

	Demand elasticity			
Assumed demand shift	-0.5	-1	-2	-3
0.5%	-288,851	-165,781	-104,245	-83,733
1%	-578,624	-332,022	-208,720	-167,620
1.5%	-869,318	-498,724	-313,426	-251,660