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Public version

Memo

To: Phil Taylor, David Blacktop and Kate Frankish
Date: 16 March 2011
From: James Mellsop, Kevin Counsell and Will Taylor
Subject: CWH/WSI Detriments Analysis

1. Introduction

In our 8 February 2011 report quantifying the benefits and detriments of the proposed CWH/WSI merger, we generally adopted models used by the Commerce Commission in previous authorization decisions.

In response to a request from the Commission, you have asked us to consider how we would quantify productive and dynamic efficiency losses if we were "starting with a clean slate". You have also asked us to identify:

- What point in the range of detriments calculated in our 8 February 2011 report we think is most relevant; and
- What information is available that might assist the Commission to obtain greater certainty about the size of the price elasticity of demand for scouring services.

We set out our responses in this memo.

2. Productive Inefficiency

2.1. Introduction

It is widely recognised in the economics literature that a material reduction in competition can reduce static (allocative and productive) efficiency.[1] Allocative efficiency, which refers to efficiency in resource allocation, is reduced when a firm with market power produces too little output and charges too high a price relative to the competitive outcome. Productive efficiency,

[1] For example, see Chapter 2 of Massimo Motta (2004), *Competition Policy: Theory and Practice*, Cambridge University Press; and Chapter 4 of Dennis Carlton and Jeffrey Perloff (2005), *Modern Industrial Organization*, Fourth Edition, Addison-Wesley.

which refers to efficiency in internal firm production, is reduced when a firm with market power faces less pressure to reduce costs or adopt newer and more efficient technologies as they become available. Indeed, the traditional justification for deregulating monopoly has been to improve static efficiency (and to reduce surplus transfers from consumers to the monopolist).

However, it is also common ground in the economics literature that mergers can promote productive efficiency, e.g., from merger-specific cost savings, which can partially or fully offset productive efficiency losses from reduced competition.[2] Our discussion here is focussed solely on the productive efficiency losses from reduced competition – the efficiency gains are calculated separately in our 8 February 2011 report.

The magnitude of productive efficiency losses depends on the particular facts, including (but not limited to) the extent of the competitive constraint that is lost, and the remaining pressures on the merged entity for productive efficiency. Our approach in this memo is to consider what the economics literature says about the magnitude of productive efficiency losses in general, and then apply that to the facts of the wool scouring industry to consider what the loss might be in that industry in particular.

2.2. Economics Literature

Our starting point is to consider the economics literature. There are numerous techniques identified in the literature for quantifying productive efficiencies,[3] but most of these are relatively complex, data intensive, and appear to be more broadly suited to an industry-level analysis, rather than for merger-specific analysis as is required here.

Nonetheless, while we may not apply the techniques themselves, the results of these broad industry-level studies are still informative, as they can provide an indication of the productive efficiencies that result from increases in competition. Many of these studies estimate changes in total factor productivity (TFP) growth from increases in competition or between monopoly and competition. TFP growth is defined as the ratio of output growth to input growth, and is generally considered to be a good measure of productive efficiency.[4] An increase (decrease) in TFP is associated with an increase (decrease) in productive efficiency. That is, an increase in

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[2] See, e.g., Motta (2004), *op cit.*, pp.238-242.

[3] For a review see T.J. Coelli (1995), "Recent Developments in Frontier Modelling and Efficiency Measurement", *Australian Journal of Agricultural Economics*, 39(3), 219-245.

[4] Caves and Christensen (1980) contend that TFP is the "best single measure of productive efficiency". Douglas W. Cave and Laurits R. Christensen (1980), "The Relative Efficiency of Public and Private Firms in a Competitive Environment: The Case of Canadian Railroads", *Journal of Political Economy*, 88(5), 958-976.

TFP means that more output can be produced for the same inputs or, equivalently, the same output can be produced with fewer inputs i.e., cost savings.

There are some empirical studies in the economics literature that estimate the annual percentage improvement in productivity as a result of introducing or increasing competition. Nickell (1996) finds that a firm operating in a more competitive environment in the UK manufacturing sector will have higher annual TFP growth by between 3.8 and 4.6 percentage points (compared to a firm operating in a less competitive environment).[5] [6] Disney, Haskel and Heden (2003) analyse a larger sample of UK manufacturing firms than Nickell (1996), and using a similar methodology find that increased competition leads to an increase in annual TFP growth by 1.3 percentage points (again, compared to a firm in a less competitive environment).[7] Daβler, Parker and Saal (2002) provide a similar analysis, testing the impact of liberalisation on TFP growth in the telecommunications market.[8] Their results show that, on average, TFP growth increased by approximately 3 percentage points in the year following liberalisation (i.e., moving from monopoly to competition) of telecommunications markets.[9]

What these results indicate is that a firm in a relatively more competitive market will have annual TFP growth of between approximately 1 percentage points and 5 percentage points higher than a firm in a relatively less competitive (or monopoly) market. To put this another way, if the annual productivity growth of a firm in a less competitive market is static, all else equal, the same firm in a more competitive market would have annual productivity growth of between approximately 1 percent and 5 percent.

A reasonable approach to quantifying productive efficiency gains (or loses) from an increase (or reduction) in competition would be to apply the appropriate results from this literature to the relevant costs. The relevant costs to which productive efficiency gains (or losses) are applied (i.e., total costs or variable costs) depends on the timeframe of the analysis.

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5 Nickell, Stephen (1996), “Competition and Corporate Performance”, *Journal of Political Economy*, 104(4), 724-746.

6 Nickell measures a firm’s rents as the difference between profit and capital costs, and notes that higher rents are generated by a lack of competition in the market. Nickell then compares TFP growth at the 80th and 20th percentile rents, and finds that the difference between these amounts to a 3.8 to 4.6 percentage point difference in TFP growth in favour of firms with lower rents (i.e., more competition).

7 Disney, Richard, Jonathan Haskel, and Ylva Heden (2003), “Restructuring and Productivity Growth in UK Manufacturing”, *Economic Journal*, 113, 666-694.

8 Daβler, Thoralf, David Parker and David S. Saal (2002), “Economic Performance in European Telecommunications, 1978-1998: A Comparative Study”, *European Business Review*, 14(3), 194-209.

9 Calculated from Daβler et al (2002) Table VIII , page 204 based on the average percentage change in the TFP index for the relevant countries for the year following liberalisation.

In the long-run, productivity gains will likely be realised on both fixed and variable costs. Indeed, in the *Gas Control Inquiry*, the Commission applied productive efficiency gains of 0.83% per annum to total costs to ensure consistency with the Commission's long-run (12-year) model.[10]

In contrast, a firm has less ability to make productivity gains on its fixed costs in the short to medium-term, and so these gains would more likely be realised only for variable costs. In the *Newco* merger, the Commission's productive efficiency loss of 5-10% is applied to what appear to be variable costs, to obtain an annual cost reduction for a single year. Similarly, in *Air NZ/Qantas* the productive efficiency loss of 1-5% was applied to variable costs for an annual cost reduction in a single year.[11]

In our 8 February report, we have applied the Commission's previous range of 1% to 10% to just variable costs, over a five-year timeframe. Because of this five-year timeframe, it is arguable that the percentage should also be applied to fixed costs, at least in the later years of the timeframe. On the other hand, the 10% figure is significantly higher than the figures that are suggested in the literature, even when the comparison has been with introducing competition from a previous statutory monopoly. Further, the values at the back end of the five-year period should be discounted to account for the time value of money. Therefore the approach we adopted in our 8 February report provides a reasonable estimate of a possible range (we discuss our view of the likely productive inefficiencies in the next section).

2.3. Productive Inefficiencies of the Proposed Merger

Regarding the appropriate point in the range for the productive efficiency detriments, the actual magnitude of productive efficiency losses will depend on the particular circumstances, including the constraints that continue to operate on the merged entity in the factual relative to the counterfactual.

At least one of the figures presented from the above studies relates to productive efficiencies resulting from a move from pure monopoly to competition (the Daβler, Parker and Saal study), and the other two studies are likely to relate to quite a large increase in competition (from the 80th to the 20th percentile rents). While the merged CWH/WSI would be the only wool scourer in New Zealand, it appears that the most material of the pressures to be productively efficient would remain post-merger, being:

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10 Commerce Commission, "Gas Control Inquiry", Final Report, paragraphs 6.40 and 6.41.

11 The Commission did note in that decision that it had conservatively assumed only variable costs were affected, whereas fixed costs may also have been affected (*Air NZ/Qantas*, paragraph 1141).

- The threat of increased exports of greasy wool to China;
- The continued threat of entry; and
- The declining supply of wool grown in New Zealand (meaning that the merged entity's demand curve will be shifting inwards).

In contrast, the current constraint from WSI appears to be relatively immaterial:

- CWH estimates that WSI has only **[ ]** of the commission scouring market;
- **[ ]**[12] and
- Comments from merchants that they are reluctant to use WSI as doing so would provide WSI with information about their wool blends and customers.[13]

In these circumstances, the evidence suggests that the removal of WSI is unlikely to materially lessen the pressure on the merged entity to be productively efficient.

In addition, the merged entity would continue to have a concentrated group of shareholders (Cavalier Bremworth, Direct Capital and the ACC) with strong incentives to maximise profits, and therefore reduce costs. As Tirole (2006) discusses, concentrated shareholdings mean that each shareholder has a relatively large incentive and ability to monitor management, and a material influence on the strategic direction of the company.[14]

Accordingly, we think it would be appropriate to place most weight on the lower end of the percentage range identified in the literature, e.g., 1% to 2.5%. Based on our 8 February 2011 report this provides estimates of productive efficiency losses of **[ ]**.

As discussed above, we recognise that it is at least arguable that this 1% to 2.5% range should be applied to variable and fixed costs. As the figures in our 8 February 2011 report analysis were

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[12] Authorisation Application, para 15.14.

[13] As noted by the Commission in *Decision 666* (para. 128). While the Commission suggested that because of merchants' small margins they would still switch or threaten to switch to WSI's scouring operations, a merchant faced with a price increase from CWH would nonetheless have to trade off these lower margins against revealing information to a competitor. In *Decision 666*, the Commission treated WSI as just one of several constraints.

[14] See Tirole, Jean (2006), *The Theory of Corporate Finance*, Princeton University Press, for a careful analysis.

based on variable costs, we have applied the 1% to 2.5% range to variable and fixed costs, where the latter includes a return of capital (depreciation) and a return on capital. Using data from the annual accounts of CWH and WSI for depreciation and the value of the asset base, and assuming a cost of capital of 10%, the 1% to 2.5% range applied to total costs provides estimates of productive efficiency losses of **[**
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3. Dynamic Inefficiency

3.1. Introduction

There is some empirical evidence that there is an inverted U-shape relationship between competition and innovation.[15] In other words, an increase in competition from the monopoly position is associated with an increase in innovation, while at the other extreme "perfect competition" is not conducive to innovation.[16] While the robustness of the evidence for this inverted U-shape relationship is debated, it is less controversial that a monopoly will be a less efficient innovator than a firm with rivals.[17]

On the other hand, as with static efficiency gains, it is also found in the economics literature that mergers can lead to dynamic efficiency gains.[18] In the case of our 8 February report, dynamic efficiency gains from the merger were quantified as the improved brightness of wool resulting from the investment in increased throughput at the Awatoto and WSI scour lines. Again, our discussion here is focussed only on dynamic efficiency losses from reduced competition, and not the offsetting quality benefits.

As with productive inefficiency, we consider first what the economics literature says about the magnitude of dynamic efficiency losses in general, and then apply that to the facts of the wool scouring industry in particular.

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15 See, e.g., Aghion, Philippe, Nick Bloom, Richard Blundell, Rachel Griffith and Peter Howitt (2005) "Competition and Innovation: An Inverted U-Relationship", *The Quarterly Journal of Economics*, 701-728.

16 In the real world, perfect competition is not a market structure readily observed.

17 See Katz, Michael L and Howard A Shelanski (2007) "Mergers and Innovation", *Antitrust Law Journal*, 74(1), 1-86.

18 See Röller, Stennek and Verboven (2006), whose categorization of the efficiency gains from mergers includes the dynamic aspect of increased technological progress. Lars-Hendrik Röller, Johan Stennek and Frank Verboven (2006), "Efficiency gains from mergers", in F. Ilzkovitz and R. Meiklejohn (eds.), *European Merger Control: Do We Need an Efficiency Defence?*, Edward Elgar Publishing Limited, Cheltenham.

3.2. Economics Literature

As with productive inefficiency, our starting point to quantifying dynamic inefficiency on a first principles basis would be to consider techniques used in the economics literature. In industries where innovation results in “new markets”, Hausman (1997) pioneered a technique for quantifying dynamic efficiency gains, by measuring the consumer benefits that arise from a new product.[19] Hausman applied this technique to voice messaging services and cellular telephone services, and his technique has since been applied to other products such as minivans and satellite television.[20] In essence, this technique measures the consumer surplus that would be generated by a new product or market i.e., the entire area below the new demand curve and above the market price. Using a total surplus standard, Hausman’s technique would imply that producer surplus should also be included i.e., the entire area above the new supply curve and below the market price.

Note though that in wool scouring, the dynamic efficiency gains are likely to be more modest – they are likely to be around improvements in the techniques for cleaning greasy wool, rather than the introduction of an entirely new product. We are not aware of any specific techniques in the economics literature that quantify the dynamic efficiency gains from improvements to existing products, but by analogy with the Hausman approach these could be quantified by consumer and producer surplus changes that result from changes in the position of the existing demand curve.

This is exactly the Commission’s approach which, subject to incorporating a price effect, is what we have used in our estimate of the detriments. Thus, the Commission’s demand shift approach to quantifying dynamic efficiency gains appears reasonable on a first principles basis for the wool scouring industry. (We are not so sure about the Commission’s alternative approach, which involves multiplying revenue by a factor of 0.5%-1.5% - this seems to us to be more arbitrary, and indeed “process innovations” are probably covered by the productive inefficiency estimate anyway).

3.3. Dynamic Inefficiencies of the Proposed Merger

We have not come across any specific literature that would assist in determining how large the demand shift should be. The Commission has adopted a range of 0.5% to 1.5%. We expect that the appropriate range would vary markedly across industries. One way to test the

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19 Hausman, Jerry (1997), “Valuing the Effect of Regulation on New Services in Telecommunications”, *Brookings Papers on Economic Activity: Microeconomics*, 1-38.

20 See Amil Petrin (2002), “Quantifying the Benefits of New Products: The Case of the Minivan”, *Journal of Political Economy*, 110(4), 705-729; and Austan Goolsbee and Amil Petrin (2004), “The Consumer Gains from Direct Broadcast Satellites and Competition with Cable TV”, *Econometrica*, 72(2), 351-381.

appropriateness of this range for the present case is as follows. The analysis of quality benefits in our 8 February 2011 report shows that for a one unit increase in the Y value, the demand curve will shift upwards by **[ ]**. Based on total New Zealand pre-merger output, this implies an increase in output of between **[ ]**, depending on the upwards shift in the demand curve and elasticity.[21]

We also know that CWH has added a unit of Y to its output over the past 10 years.[22] **[**

] Of course there may have been other innovations across this time as well, and so we might expect the annual average demand shift to have been higher than this range. Nevertheless, keeping in mind that the objective here is to identify the size of the *reduction* in the demand shift due to the merger, this analysis suggests that the Commission's 0.5%-1.5% range is probably on the high side. For example, if the historical demand shift has been 2% per year, then it would seem extreme to assume that the merger would reduce the future demand shifts to 0.5% per year, given that the merged CWH/WSI would remain subject to the competitive and demand-side pressures (and the limited current constraint from WSI) discussed in section 2.3, and so should not be regarded as a monopoly.

Accordingly, we think it would be appropriate to place most weight on the lower end of the dynamic inefficiency range estimated in table 3.5 of our 8 February 2011 report. This is reinforced by our view that the "revenue multiple" approach (as estimated in table 3.4 of our 8 February 2011 report) seems ad hoc.

As a final comment, were we to start with a clean slate for all the benefits and detriments that used a supply and demand curve relationship (i.e., quality benefits, allocative inefficiency detriments and dynamic inefficiency detriments), one possible approach would be to start with an integrated model of benefits and detriments so that all of the price and quantity effects could be captured in a single model. The main difficulties with this, aside from the obvious complexity of the approach, is that it would not allow for separate identification of each of the benefits and detriments, and that it would likely require proprietary software to implement (e.g., Mathematica or Matlab) that would be harder for others to scrutinise.

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21 This is calculated by applying a one unit increase in Y to total New Zealand volumes and determining the implied percentage change in quantity. **[**

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22 See 18.44 (b) and Figure 7 of the Application.

4. Price Elasticity of Demand

Price elasticity of demand is typically measured by estimating a demand equation using econometric techniques, from which own- and cross-price elasticities can be determined. To do so rigorously requires a substantial amount of information. At a minimum, a time series of observations of price and quantity for the product in question is necessary, but for a robust estimate other variables such as prices and quantities of substitutes, "cost-shift" and "demand-shift" variables are also required. It has been suggested that a minimum of 50 observations is required to produce meaningful results, but a longer time series is recommended.[23] More robust estimation can also be obtained if prices and quantities change frequently, whereas if price changes are infrequent more data would likely be required. Indeed, estimation of demand equations is often best suited to products for which scanner data exists and this sort of information is readily available, such as products that are sold in supermarkets.[24]

In the case of wool scouring, we understand that prices are changed relatively infrequently. To obtain a meaningful econometric estimate of demand elasticity would therefore require a long time series e.g., if annual average prices were the least aggregated at which to assess demand elasticity, to obtain at least 50 years of data going back to 1961 (based on the above noted suggestion of a minimum of 50 observations) would likely be very difficult.

Moreover, the long time series in itself would also pose estimation difficulties, as it would require that there be more variables to control for factors that would likely change over the long-term. For example, the number of wool scourers has fallen over the long-term, and the nature of the competitive interaction between the remaining firms may have consequently changed. These changes are likely to affect the estimation of demand elasticities.[25] The longer time series may also create difficulties in sourcing information on cost-shift and demand-shift variables over the same period.

In the absence of robust econometric estimates of demand elasticity, the alternative is to rely on more indirect data and evidence.

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[23] LECG (1999), "Quantitative Techniques in Competition Analysis", Prepared for the Office of Fair Trading, October, paragraph 9.7.

[24] For a review of demand system estimation using scanner data see Daniel Hosken, Daniel O'Brien, David Scheffman, and Michael Vita (2002), "Demand System Estimation and its Application to Horizontal Merger Analysis", Federal Trade Commission Bureau of Economics Working Paper No. 246.

[25] For example, Baker and Bresnehan (1988) incorporate a variable to deal with changes in the strategic interaction amongst firms in their model to estimate demand elasticities in the US beer industry; Jonathan Baker and Timothy Bresnahan (1988), "Estimating the Residual Demand Curve Facing a Single Firm", *International Journal of Industrial Organization*, 6, 283-300.

As we understand it, wool has to be scoured before it can be used for end products. While many of the end products are likely to have substitutes (e.g., cotton apparel, synthetic carpets, blankets, etc), since wool used in these end products has to be scoured it may well be that the *market* demand for scouring is relatively inelastic.

However, *market* elasticity is not what is relevant here. Rather what is relevant here is the *residual* demand elasticity facing the merged entity. This will be higher (in an absolute sense) than the market demand elasticity to the extent that merchants have economic alternatives to the merged entity.

As well as having the data difficulties discussed above, another difficulty is that any “natural experiments” that we can identify have occurred in the present or even historical market structures. Keeping that caveat in mind, it is interesting to consider **[**

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Using CWH’s current prices, variable costs and quantities, we have carried out a critical loss analysis, and calculated a critical elasticity for CWH today. The results are set out in Table 4.1.

Table 4.1
CWH critical loss analysis

	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%	**[ ]**	**[ ]**	**[ ]**	**[ ]**	**[ ]**	**[ ]**

If **[ ]** this implies that CWH's actual residual demand elasticity exceeds (in absolute terms) approximately **[ ]** (i.e., it is expected to lose more than **[ ]** of current sales). By how much, we cannot say from this analysis.

We would expect the residual demand elasticity facing the merged entity to be smaller (in absolute terms) than the residual demand elasticity facing CWH today. However, if the main constraint on pricing today comes from the potential for greasy wool exports to China and/or the threat of entry as opposed to WSI, then we would not expect the residual demand elasticity to change much. We also note that the merged entity's incentive and ability to raise price will be constrained by the declining supply of wool grown in New Zealand and the low profitability in the wool industry. It would be in the merged entity's long-term interests to behave in a way that strengthens the profitability of the industry (the superstore concept is an example of this).

As a final point, the Commission has suggested that because the scour charge is relatively minor in terms of the overall return (and volatility) to growers, then the demand of merchants for scouring may be relatively inelastic, as merchants will be confident of passing any higher scouring charges through to lower wool prices to growers. However, this proposition is inconsistent with the fact that CWH's real prices have fallen since at least 2006/07, as demonstrated in Figure 4.1 and Figure 4.2 below.[26] That is, CWH's margins have been squeezed over time (assuming that CWH's costs have increased in line with the inflation index underlying the calculation of real prices), and this appears inconsistent with the proposition that demand is inelastic and CWH could raise prices over time.

[26] Real prices are calculated using June 2006 as the base year.

Figure 4.1
Average price - South Island

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Figure 4.2
Average price - North Island

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