

# **Market study into retail fuel – use of Tobin’s q to assess market power**

**Report for Z Energy Ltd**

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## 1. Executive Summary

### 1.1 Our task

Z Energy has asked us to comment on the Tobin's q value that the Commerce Commission has estimated for it in its draft report on New Zealand's retail fuel sector,<sup>1</sup> and what inferences can appropriately be drawn from the approach the Commerce Commission has adopted. The Commission's intention is to assess whether an efficient new entrant would be likely to earn a profit that exceeds its cost of capital if it was to enter the market, and to draw an inference from this as to whether the outcomes observed in the retail fuel sector are consistent with those in a workable or effectively competitive market.<sup>2</sup>

### 1.2 Tobin's q

In its draft report on the major fuel retailing businesses in New Zealand, the Commerce Commission of New Zealand (Commerce Commission) has placed considerable reliance on Tobin's q as an indicator of the effectiveness of competition, although the concept was originally developed to explain investment behaviour in a macro-economic context. The formula for q is as follows:

$$q = \frac{\text{Market Value}}{\text{Replacement Cost}}$$

The Commerce Commission has relied heavily on a 1981 paper by Lindenberg and Ross (L&R), who were the first to estimate the replacement cost of assets for a sample of US firms. They found that q was approximately 1.5 for an extended period and ascribed this to the "capitalised value of the Ricardian and monopoly rents." The Commission estimated q values ranging from 1.3 to 2.1 for New Zealand's retail fuel businesses and has adopted L&R's view that if a q>1 is observed this is likely to be due to an absence of effective competition.

### 1.3 Our findings

Our findings can be summarised as follows:

- First, the Commerce Commission's establishment of q=1 as a benchmark in the current period (and any short period) as the outcome that would be observed in a workably competitive market is unsustainable and unreasonable, since:
  - we find that over several decades the observed value of q is extremely volatile, fluctuating between values well below and well above unity, with high standard errors that create a very wide confidence interval range
  - current values of Tobin's q are elevated relative to experience over the decades since 1964 (due to a strong equity market and the effect on investor behaviour of the record low interest rates), and

<sup>1</sup> Commerce Commission, (20 August, 2019), *Market study into the retail fuel sector, Draft report.*

<sup>2</sup> We use the terms workable and effective competition interchangeably in this report.

- even in regulated businesses where prices are tied much more closely to cost than in a workably competitive market, considerable variation is observed in the regulatory-equivalent of Tobin's q (the ratio of the market value to regulatory asset base).
- Secondly, the Commerce Commission has made a number technical and conceptual errors in its calculation of q, including:
  - using the incorrect number of shares when estimating market value
  - providing an insufficient allowance for intangible brand and organisational capital
  - applying replacement cost estimates that embody an accounting rather than economic concept of depreciation
  - ignoring assets associated with the contracts that were acquired from Chevron NZ (Chevron)
  - including the lease liability associated with operating leases in the denominator rather than the replacement cost of the assets, and
  - possibly ignoring the potential for a new entrant's costs to be higher than those of Z Energy.

When these technical and conceptual errors are considered as a whole, it is clear that when corrected and properly interpreted, the Tobin's q that would be estimated for Z Energy is not suggestive of an absence of effective competition.

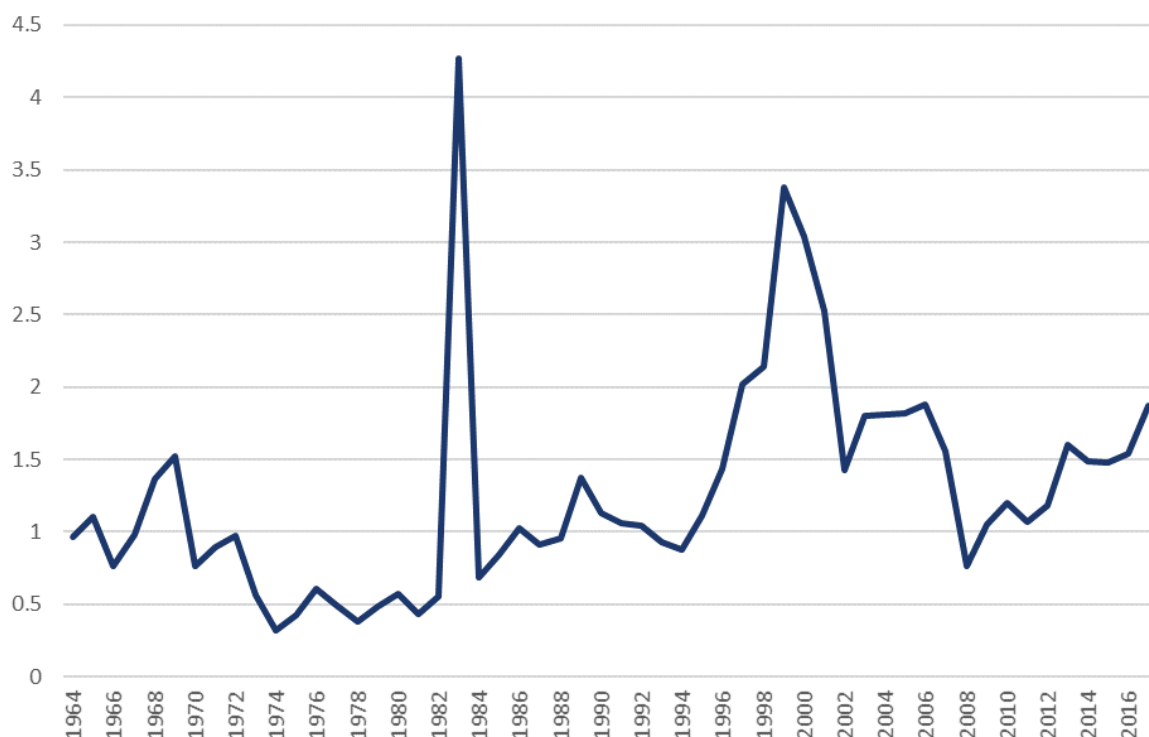
#### **1.4 The Commerce Commission's benchmark $q=1$ is unsustainable and unreasonable**

The Commerce Commission's use of a benchmark q value of unity is unsustainable and unreasonable to apply in any short period, but particularly at this time of elevated q values. A  $q=1$  condition assumes that financial and product markets are in perfect alignment, whilst in practice these markets will be affected by different factors, implying that misalignment would not be unusual:

- The q theory that was initially derived as part of a macro-economic theory of investment looked at it in terms of a long run equilibrium condition that would rarely (if ever) obtain in practice.
- The numerator of q is a forward-looking market value that is based on expectations of future cash flows that include estimates of future capital expenditure, while the denominator is based on currently installed assets (albeit restated as a replacement cost). This ensures a misalignment of values that may at different times be positive or negative:
  - When market expectations of future growth options or cash flows are highly positive, or discount rates (risk-free interest rates) are unusually low, market values will be elevated relative to the replacement cost of installed assets, implying  $q>1$ ; and
  - When market expectations are pessimistic and /or discount rates are high, the numerator (market value) will fall faster than the replacement cost of assets in place, while some committed capital expenditure projects (even R&D programs) may continue to grow, which could drive q estimated at a point in time below unity.

These observations suggest that q, properly estimated, would be expected to vary considerably over time, and that it would be inappropriate to conclude from an observation of  $q > 1$  at a point in time, or even over several years, that competition is ineffective. In Figure 1.1 below we display the average Tobin's q estimated for the sample of S&P500 Index firms in the US.<sup>3</sup> We find that Tobin's q was at very low levels (less than 1) during the 1970s, but subsequently spiked in the 1980s, rose to high levels during the dot-com boom of the 1990s, fell precipitously as market values collapsed during the early 2000s and global financial crisis, and has in recent years resumed its climb to be close to 2.0 by 2017.

Figure 1.1: Average Tobin's q for S&P500 Index firms, 1964 to 2017



Source: Ryan Peters, co-author of Peters and Taylor (2017)<sup>4</sup>

We expect the reasons for q's general rise since the global financial crisis include:

- The general rise in the S&P500 index since that time

<sup>3</sup> These estimates of "Total q", which include both physical and intangible capital in the denominator, are based on the approach used in Ryan Peters, and Lucian A. Taylor, (2017), "Intangible capital and the investment-q relation", *Journal of Financial Economics*, Vol. 123, p.259. We use the trend in Tobin's q for the US to infer the expected trend in New Zealand because current estimates of Tobin's q that address the errors in the simple estimates of q are much more readily available for the US market (in turn reflecting the fact that large companies are required to disclose replacement cost estimates and because the US capital market is subject to much more academic research).

<sup>4</sup> We obtained the Tobin's q time series data from Professor Ryan Peters, co-author of Ryan H. Peters and Lucian A. Taylor, (2017), "Intangible capital and the investment-q relation", *Journal of Financial Economics*, Vol. 123, pp.251-272.

- A fall in the risk-free rate and the associated fall in discount rates, and
- The 'drive for yield' that has accompanied lower rates for investors.

Taken in this context we would expect the majority of firms in the economy, and in this case the New Zealand retail fuel businesses, to exhibit a Tobin's q that is greater than unity at the present time. Indeed, the potential for the Tobin's q for firms in a workable competitive market to vary considerably over time has been recognised in the past by the Commerce Commission, for example when it stated that:<sup>5</sup>

*Empirical evidence ... demonstrates that while asset values in workably competitive markets characterised by specialised assets may occasionally converge with replacement costs, they only very rarely if ever equate and will normally diverge by a significant amount for a prolonged period of time, including in some cases indefinitely.*

### ***Tobin's q interpreted in a regulatory context – the EV/RAB multiple***

Even where businesses are proscribed from earning monopoly rents through regulation, variations in market demand, costs (including the risk-free rate and financing costs) and expectations about the future can result in the Enterprise Value (EV) exceeding or falling short of the Regulated Asset Base (RAB) by a considerable margin. In the main text we provide the illustrative example of the UK's National Grid, whose EV/RAB ratio fluctuated between -70 per cent and +47 per cent between 1995 and 2017.

## **1.5 The Commerce Commission has made a number of conceptual errors in its calculation of Tobin's q**

We have reviewed the method that was applied by the Commerce Commission to estimate q, and consider that several material errors have been made:

- The number of shares is over-stated – The Commerce Commission has applied 429 million shares to calculate the market value of Z Energy's equity when the actual number is 400 million. This results in an over-statement of market value by \$181.5 million.
- Use of accounting rather than economic depreciation – The Commission's lower bound for the denominator applies Z Energy's depreciated replacement cost that it uses for financial accounting purposes, which embody an accounting concept of depreciation (how should costs be allocated over time?) rather than the relevant economic concept (what is the difference in the forward-looking cost of using the existing assets rather than new assets?). Given the nature of Z Energy's principal assets (which are maintained in an "as new" condition) and the likelihood that the assets have a sufficient remaining life to cover the remaining term of the retail fuel sector, the correct economic depreciation is likely to be approximately zero.
- Deferred tax liability should not be added onto the market value – We find no support in the literature for adjusting the numerator for a deferred tax liability, which therefore creates an issue with comparability to other benchmarks for Tobin's q, such as those we discussed earlier. In

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<sup>5</sup> Quoted in Wellington International Airport Ltd & Ors v Commerce Commission [2013] NZHC [11 December 2013], para.521. This proposition was accepted by the merit review body (para.524).



addition, we observe that most (about three-quarters) of the deferred tax liability is associated with the “contracts acquired” intangible asset, which the Commission has excluded from the denominator.<sup>6</sup> While we disagree with the Commission’s exclusion of the assets associated with these contracts (see below), it would be inconsistent to seek to recognise a tax advantage to a new entrant in the numerator if the physical assets required to obtain that advantage are excluded from the denominator.<sup>7</sup> In view of the comparability issue, combined with the small share of deferred tax balance that could represent a tax advantage to a new entrant, we recommend not adjusting the numerator by the deferred tax balance.

- **Under-allowance for brand and organisational capital** – The Commerce Commission has allowed \$261 million for “software, brands and other intangibles” in the denominator of q, and has omitted another \$158 million of “goodwill” associated with the purchase of Chevron in 2017.<sup>8</sup> However, current academic research finds that a substantial portion of what firms’ report as operating expenditure is, in reality, the development of intangible assets in the form of organisation capability, human capital and brand, which a new entrant would need to replicate in order to compete. A corollary is that a material component of what is termed “goodwill” in acquisitions reflects unbooked intangible assets that were developed over years by the acquired business, which again would need to be developed if it had not been purchased. Academic researchers have commonly considered 30 per cent of Selling, General and Administrative Expense (SG&A) to represent investments in brand development, organisational development and human capital, and have assumed that this depreciated over 5 years. Applying this approach to Z Energy produces an estimate of unbooked steady-state intangibles investment of approximately \$154 million.<sup>9</sup> We recommend that an appropriate recognition of the potential material understatement of Z Energy’s intangibles would be to include the goodwill component on Z Energy’s balance sheet associated with the acquisition of Chevron (\$158 million) in the denominator of the Tobin’s q calculation.<sup>10</sup>
- **Chevron contracts** – The Commission has excluded the “contracts acquired” intangible asset from the denominator, notwithstanding that the underlying revenue stream includes the recovery of physical assets that were installed by Chevron (albeit with the legal title transferred to the counter-parties). Thus, for a new entrant to replicate the underlying revenue stream, it would need to incur the replacement cost of those assets, and so this amount should be included in the

<sup>6</sup> That is, the Commission has said that a new entrant could earn the revenue stream associated with these intangible asset without needing to install any physical assets.

<sup>7</sup> A new entrant could obtain a tax benefit over an incumbent if accelerated depreciation is permitted for tax purposes. However, for the benefits of accelerated depreciation to accrue, physical investment is required. Hence, if it is assumed that a new entrant would not need to invest, it would be illogical to assume that the new entrant would receive a tax advantage over the incumbent.

<sup>8</sup> We consider separately below the issue of the “contracts acquired” as part of the Chevron acquisition, which we conclude are associated with tangible assets.

<sup>9</sup> This \$154 million reflects the steady-state intangible capital that would accumulate if 30 per cent of \$205 million (\$61.5 million) was invested each year and depreciated on a straight-line basis over 5 years (with half a year of depreciation applying to the expenditure in the first year).

<sup>10</sup> In section 2 of the main text, we present academic evidence referring to a benchmark intangible capital intensity level of 43 percent. While that work is very relevant at illustrating the growing importance of intangible assets in businesses generally, applying that benchmark to Z Energy would imply an intangible capital estimate exceeding \$800 million. We think this quantum is implausible, and most likely reflects differences in the relative importance of tangible assets between businesses from which the benchmark was derived and Z Energy.

denominator. While we have not been able to obtain an estimate of the replacement cost of these assets in the time available to make submissions, we recommend including the intangible asset as a proxy for the cost of the physical assets,<sup>11</sup> noting that the replacement cost of the underlying assets could be higher or lower than this amount.

- Assets subject to operating leases – the Commission has included the lease liability in both the numerator and denominator in respect of the assets subject to operating leases, whereas a new entrant would need to incur the replacement cost of the assets if it entered the market. We have not been able to obtain an estimate of the replacement cost of these assets in the time available to make submissions.
- New entrant costs relative to Z Energy – We also agree with Z Energy's position that its replacement cost estimates are likely to understate the costs that a new entrant would bear, including because of differential environmental and other standards and differences in the qualities of sites. We have not been able to obtain an estimate of the greater asset cost that a new entrant would bear relative to Z Energy in the time available to make submissions.

In the table below we show the successive impact on the estimate of Tobin's q for Z Energy in March 2019 when corrections are made for the errors noted above. The alternative estimates are:

- 2.05 – based on the Commerce Commission's draft report.
- 1.95 – when the corrected market capitalisation is applied.
- 1.57 – when economic depreciation is used (which we assume to be zero).<sup>12</sup>
- 1.47 – when a more reasonable allowance is made for Z Energy's intangible assets.
- 1.44 – when the impact of the deferred tax liability is removed.
- 1.28 – when an allowance for the assets associated with the Chevron contracts is included.

Moreover, we observe that these estimates do not account for the two additional factors that may reduce the estimated Tobin's q for Z Energy even further (but which we have not been able to quantify in the time available for submissions), namely:

- the likely premium of the replacement cost of Z Energy's leased assets over the lease liabilities, and
- the potential for Z Energy to have a cost advantage over a new entrant.

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<sup>11</sup> As well as adding the "contracts acquired" intangible asset to the denominator, we have re-included the deferred tax balance adjustment the Commission made to the numerator to be consistent with our argument above although, as we discussed above, the deferred tax balance adjustment may create problems with comparability to other benchmarks for Tobin's q.

<sup>12</sup> For the purpose of this report, we have back-calculated the replacement cost of Z Energy's specialised assets from the mid-point of the range for the Tobin's q values the Commission reported in Table D7.

**Table 1.1: Re-worked estimates of Tobin's q for Z Energy at 31 March, 2019**

	[1]	[2]	[3]	[4]	[5]	[6]
	Commerce Commission	Fix number of shares	Apply economic not accounting depreciation	Appropriate allowance for intangibles	Delete deferred tax balance adjustment	Include assets associated with Chevron contracts
Numerator (\$m)	3,850	3,668	3,668	3,668	3,597	3,668
Denominator (\$m)	1,880	1,880	2,333	2,491	2,491	2,871
Tobin's q	<b>2.05</b>	<b>1.95</b>	<b>1.57</b>	<b>1.47</b>	<b>1.44</b>	<b>1.28</b>

Source: Commerce Commission, Z Energy 2019 annual report, and Incenta analysis

We note that the 1.28 estimate for Z Energy is materially below the average level observed for the S&P500 Index firms in recent years, and the other factors that we discussed suggest the true Tobin's q could be lower still. Thus, in our view, it is difficult to conclude from an analysis of Tobin's q that Z Energy is earning monopoly rents.

## 2. Tobin's q is volatile and not appropriate to use as a benchmark

### 2.1 Our task

Z Energy requested that we comment on:

- the Tobin's q value that the Commerce Commission has estimated for Z Energy in its draft report on New Zealand's retail fuel sector,<sup>13</sup> and
- what inferences can appropriately be drawn from the approach that the Commerce Commission has adopted.

In undertaking these tasks, it is necessary to consider the situation of an efficient new entrant, and whether that entrant would be likely to earn a profit that exceeds the cost of capital. Hence, there is a need to focus on the conditions that would be faced by an efficient new entrant.

We consider the second question in this section. In its draft report the Commission places considerable reliance on its Tobin's q estimates, assuming that the observation of q values greater than unity is an indication "that ineffective competition is the most plausible explanation for the estimated values of q above unity"<sup>14</sup> for Chevron, Z Energy and Gull.

In this section we explore whether it is appropriate for the Commission to place such heavy reliance on an observation that firms' q ratios exceed unity. We discuss the Commerce Commission's specific method of estimating q for Z Energy in the next section.

### 2.2 Tobin's q

#### 2.2.1 Definition

Tobin's q is broadly defined as follows:

$$q = \frac{\text{Market Value}}{\text{Replacement Cost}}$$

The Tobin's q ratio was first employed in macro-economic research undertaken by Tobin and Brainard (1968,1977)<sup>15</sup> and Tobin (1969, 1978).<sup>16</sup> The theory they tested was that if, at the margin, q exceeded unity, the firm would have an incentive to invest because the market value of that investment would exceed its cost, and if this process continued would drive the marginal value of q

<sup>13</sup> Commerce Commission, (20 August, 2019), *Market study into the retail fuel sector, Draft report*.

<sup>14</sup> Commerce Commission (20 August, 2019), pp.71-72.

<sup>15</sup> Tobin, J, and Brainard, W. (May, 1968), "Pitfalls in financial model building," *American Economic Review*, Vol. 58, pp.99-122; (1977), "Asset markets and the cost of capital". In B. Belassa and R. Nelson (eds.) *Economic Progress Private Values and Public Policies: Essays in Honor of William Fellner*, Amsterdam: North Holland.

<sup>16</sup> Tobin, J. (February, 1969), "A general equilibrium approach to monetary theory, *Journal of Money, Credit and Banking*, Vol.1, pp.15-29; Tobin, J. (April, 1978) "Monetary policies and the economy: the transmission mechanism," *Southern Economic Journal*, Vol. 37, pp.421-31.

towards unity. That is, the marginal  $q$  was viewed as a means of explaining the level of investment taking place in an economy.

## 2.2.2 Lindenberg and Ross (1981)

### *Theoretical basis*

The Commission's draft report is heavily reliant on the conceptual framework and empirical analysis conducted by Lindenberg and Ross (L&R) in 1981. L&R's analysis took  $q$  in a different direction from its previous application in macro-economics. They noted:<sup>17</sup>

*We will employ this argument peripherally below, but our focus is somewhat different. Our interest is in the cross-sectional value of  $q$  and its implications for industrial organisation in general, and the measurement of monopoly power in particular. The essence of the argument is that for a competitive firm, one would expect  $q$  to be close to one, and as we examine firms with increasing monopoly power (increasing ability to earn above a competitive return),  $q$  should increase. If a firm's  $q$  is greater than one, the market value of the firm is in excess of its replacement cost... Thus in the absence of barriers to entry and exit,  $q$  will be driven down to one as new firms enter (or existing firms expand if average and marginal  $q$  coincide). Similarly, a firm which is regulated so as to earn no monopoly rents would also have a  $q$  close to one.*

L&R reasoned that the actual  $q$  for a competitive firm could differ from unity for two principal reasons:<sup>18</sup>

- Firms may possess factors of production on which they earn Ricardian rents that are not captured in their replacement cost figures. Firms with good management and a lower cost structure that is inframarginal in an industry.
- In a declining industry, where technological change or other factors render its capital stock obsolescent,  $q$  may fall short of unity even if the firms are earning monopoly or Ricardian rents.

However, in general, L&R considered that observing a  $q$  value that exceed unity would be due to the "capitalised value of the Ricardian and monopoly rents which the firm enjoys".

### *Empirical findings and difficulty of interpretation*

L&R reported:<sup>19</sup>

*We have plotted the time series of adjusted values of  $q$ , averaged over our firms, from our study. The relatively constant value (approximately 1.5) indicating that the capitalized rents, earned by firms in our sample, have been sufficient to keep the average firm's market value approximately 50% above the replacement cost of its assets.*

<sup>17</sup> Lindenberg, E. B. and Ross, S. A. (January, 1981), "Tobin's  $q$  Ratio and Industrial Organization", *The Journal of Business*, Vol. 54, No. 1, pp 1-32.

<sup>18</sup> Lindenberg and Ross (1981), pp.2-3.

<sup>19</sup> Lindenberg and Ross (1981), p. 23.

However, L&R's findings for industries showed very high standard deviations (0.33 to 1.84) around the means. With average q ratios in the vicinity of 1.5, it would therefore not be possible to reject with 95 per cent confidence the null hypothesis that the means are equal to unity.

Attempting to find empirical support for their theory, L&R regressed their q ratio against the four firm concentration ratio for each firm's industry as well as the Lerner Index (approximated by the EBITDA Margin). They concluded:<sup>20</sup>

*All the coefficients have the predicted positive sign. The Lerner Index is, from all three regressions, an important contributor toward explaining monopoly and Ricardian rents. The concentration ratio, however, seems to have no significant relationship with q. Evidently, high q's can occur in concentrated or unconcentrated markets, and, conversely, low q's, indicating no significant market power, can occur in markets that have high degrees of concentration.*

We note that on its own the Lerner Index explained only 8 per cent of the variation in q (although the coefficient was highly statistically significant), and in combination with the 4-firm concentration ratio (which was nowhere near statistically significant) it explained only 29 per cent of the variation. Implausibly, L&R's regression coefficients suggest that beyond a Lerner Index value of 10 per cent (i.e. an EBITDA Margin greater than 10 per cent) monopoly rents are being earned because then Tobin's q is greater than unity. This suggests a high degree of specification bias in the estimating equation. Notably, as discussed in the section below, L&R's specification of q ignored intangible assets.

### 2.2.3 The subsequent research program examining Tobin's q

Subsequent researchers have adopted many different interpretations of q, as an index of managerial performance,<sup>21</sup> an indicator of risk not captured by the Capital Asset Pricing Model (CAPM)<sup>22</sup> and a reflection of inefficient under-investment in capital.<sup>23</sup>

Recent advances in the estimation of q have resulted from a decades long research program that recognises that since L&R's study, intangible assets are becoming more and more important in firms' total capital (physical and intangible). In their 2017 study Peters and Taylor (P&T) defined intangible capital intensity as follows:<sup>24</sup>

$$\text{Intangible capital intensity} = \frac{K^{int}}{K^{int} + K^{phy}}$$

<sup>20</sup> Lindenberg and Ross (1981), pp.27-28.

<sup>21</sup> Mork, Randall, Andrei Shleifer and Vishny (1988), "Management Ownership and Market Valuation, An Empirical Analysis," *Journal of Financial Economics*, Vol.20, pp.293-315.

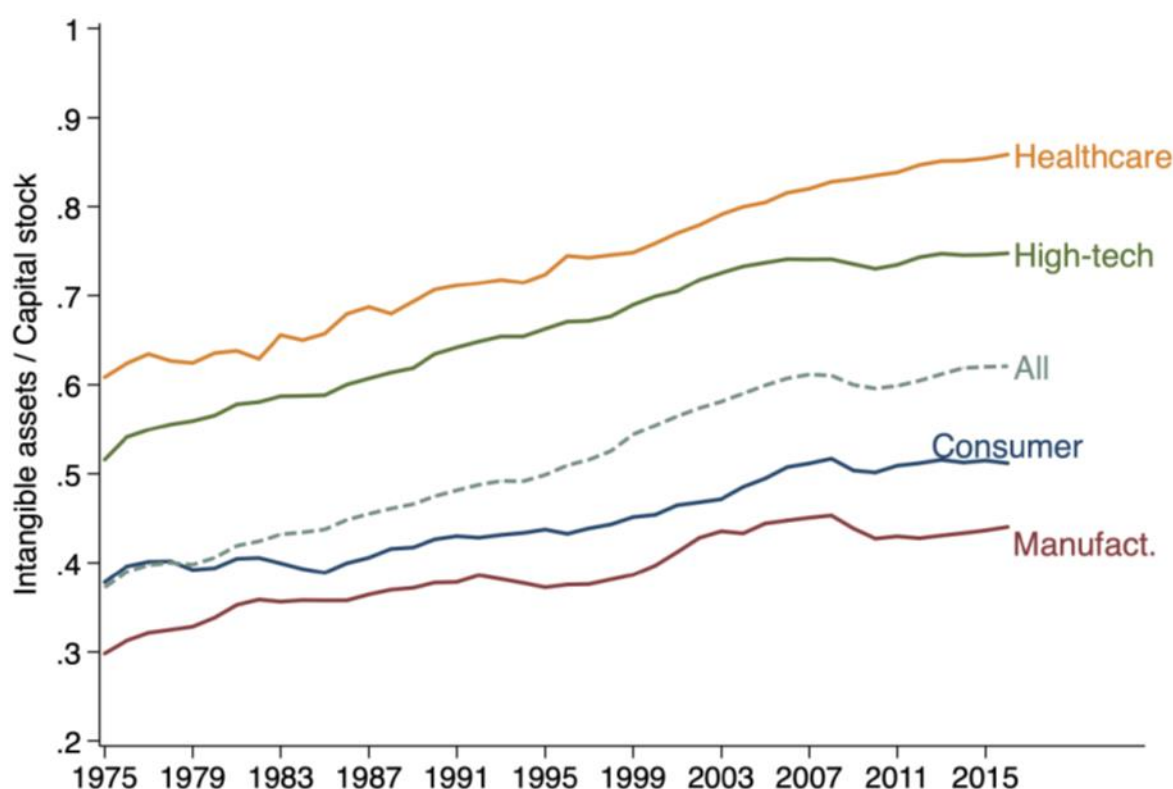
<sup>22</sup> Eugene F. Fama and James D. MacBeth, (2006), "Risk, Return and Equilibrium: Empirical Tests," *Journal of Political Economy*, Vol. 81.

<sup>23</sup> Dybvig, Philip H., and Mitch Warachka, (March, 2010), *Tobin's q Does Not Measure Firm Performance: Theory, Empirics and Alternatives*.

<sup>24</sup> Peters, Ryan H., and Lucian A. Taylor, (2017), "Intangible capital and the investment-q relation", *Journal of Financial Economics*, Vol. 123, pp.251-272, p.259.

Where,  $K^{int}$  is the replacement cost of intangible assets and  $K^{phy}$  is the replacement cost of physical capital. They found that on average over the years of their study, 1975 to 2011, “the mean (median) intangibles intensity is 43% (45%), so almost half of the capital is intangible in our typical firm year.”<sup>25</sup> The growing importance of intangible assets is displayed in Figure 2.1 below.

Figure 2.1: Intangible asset intensity over time (US)



Source: Peters and Taylor (2017), p.259

P&T drew on the developing research program examining intangible assets and their estimation to define the concept of Tobin's q, where:<sup>26</sup>

$$q = \frac{MV}{K^{int} + K^{phy}}$$

Where,  $MV$  is the Market Value of the assets,  $K^{int}$  is the replacement cost of intangible assets and  $K^{phy}$  is the replacement cost of physical capital.

In a similar vein, we note that there is a growing literature about the importance of intangible assets in retail-type activities. It has been observed that in recent decades that the market valuations of retail sector firms in the US have been growing rates that are substantially greater than the observed growth

<sup>25</sup> Peters, Ryan H., and Lucian A. Taylor, (2017), “Intangible capital and the investment-q relation”, *Journal of Financial Economics*, Vol. 123p.258.

<sup>26</sup> Peters, Ryan H., and Lucian A. Taylor, (2017), “Intangible capital and the investment-q relation”, *Journal of Financial Economics*, Vol. 123, p.259.

rate in physical assets. Researchers have proposed that in large measure the answer to this riddle is to be found in the growing importance of intangibles. For the US retail sector, Crouzet and Eberly (2018) observed:<sup>27</sup>

*Thus, over the 1995-2015 period, balance sheet intangible capital in the sector rose as acquisition values included a larger share of intangible assets.*

At the same time, they observed that the productivity per employee was rising during that period, which was the return on increasing investment in intangibles such as brands, logistics and improved distribution networks. They concluded:

*The full value of these innovations may not be reflected in book capital assets, and instead only manifest in acquisition prices.*

This is further evidence that the theoretical framework developed by L&R in 1981, and followed by the Commerce Commission's draft report, is not capable of appropriately analysing an investment framework that incorporates intangible capital, which has become even more important than it was in 1981.

## **2.3 Volatility of Tobin's q over time and within industries**

### **2.3.1 Introduction**

Our view is that the Commerce Commission's use of a benchmark q value of unity is not sustainable and is unreasonable to apply in any short period and particularly, as we show below, during this period of elevated q values. A q=1 condition assumes that financial and product market are in perfect alignment, whilst in practice these markets will be affected by different factors, implying that misalignment would not be unusual:

- The q theory that was initially derived as part of a macro-economic theory of investment looked at it in terms of a long run equilibrium condition that would rarely (if ever) obtain in practice.
- The numerator of q is a forward-looking market value that is based on expectations of future cash flows that include estimates of future capital expenditure, while the denominator is based on currently installed assets (albeit restated as a replacement cost). A q=1 condition assumes that financial and product markets are in perfect alignment, whilst in practice these markets will be affected by different factors, implying that misalignment would not be unusual:
  - When market expectations of future growth options or cash flows are highly positive, or discount rates (risk-free interest rates) are unusually low, market values will be elevated relative to the replacement cost of installed assets, implying  $q > 1$ ; and
  - When market expectations are pessimistic and /or discount rates are high, the numerator (market value) will fall faster than the replacement cost of assets in place, while some

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<sup>27</sup> Crouzet, Nicolas and Janice Eberly, (May, 2018), "Intangibles, Investment, and Efficiency," *American Economic Review – Papers and Proceedings*, p5.



committed capital expenditure projects (even R&D programs) may continue to grow, which could drive q estimated at a point in time below unity.

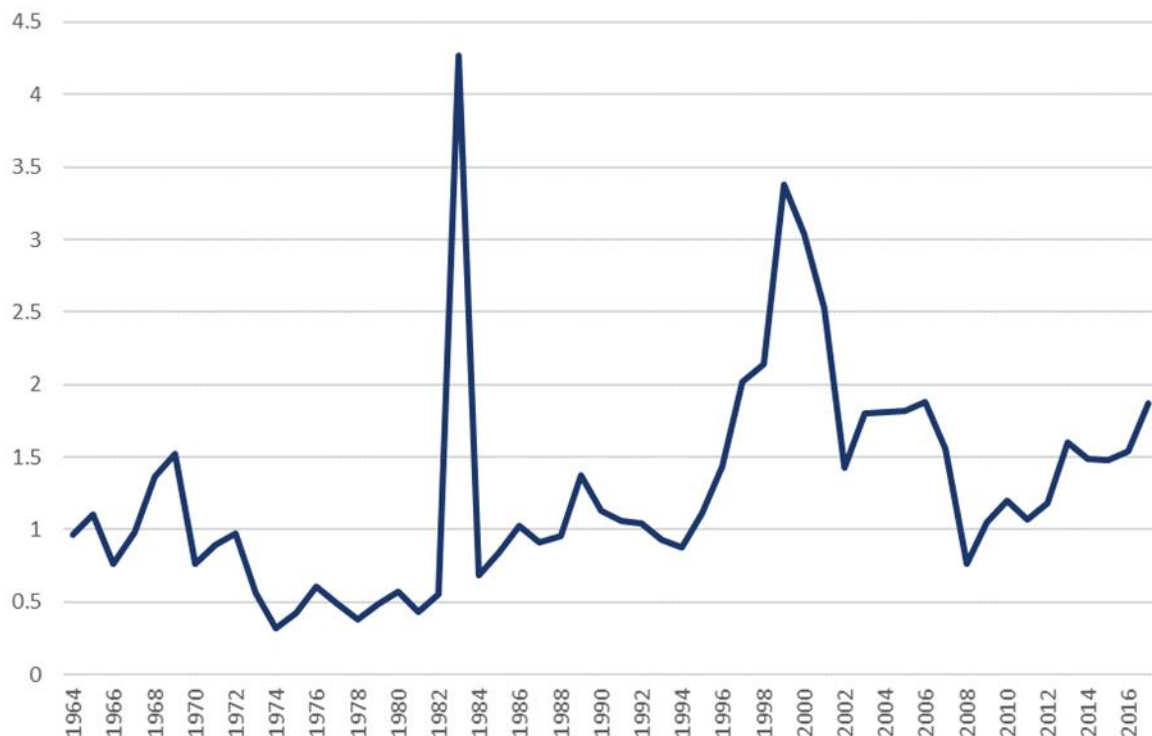
In our view q, when properly estimated, can be expected to vary considerably over time. As such, it would be inappropriate to conclude from an observation of  $q > 1$  at a given point in time, or even over a span of several years, that competition is ineffective.

### 2.3.2 Volatility of Tobin's q

Other things being equal, measuring q using the method developed by P&T has the effect of reducing the estimate of q. However, as we show below, there is still considerable volatility in Tobin's q estimates over time, both at the aggregate index level, and for individual industries.

In Figure 2.2 below we show the average Tobin's q for the S&P500 Index firms over the period from 1964 to 2017. Tobin's q for these firms fluctuated around unity during the 1960s but then fell to low levels (approximately 0.5) during the 1970s. Average q then rose through the 1980s and 1990s as the stock market recovered, and after a spike in 1983 reached a new peak in 1999 that was associated with the dot-com boom. However, even during the "halcyon days" that preceded the global financial crisis, average Tobin's q for the index firms remained elevated at approximately 1.75. The only time that the average q dipped below 1 again was in the global financial crisis (2008). Since then, in tandem with the long boom in the US stock market, Tobin's q continued to rise, and in 2017 was at a level of 1.87. For most years since 1964, average Tobin's q for firms in this sub-index has been well above unity.

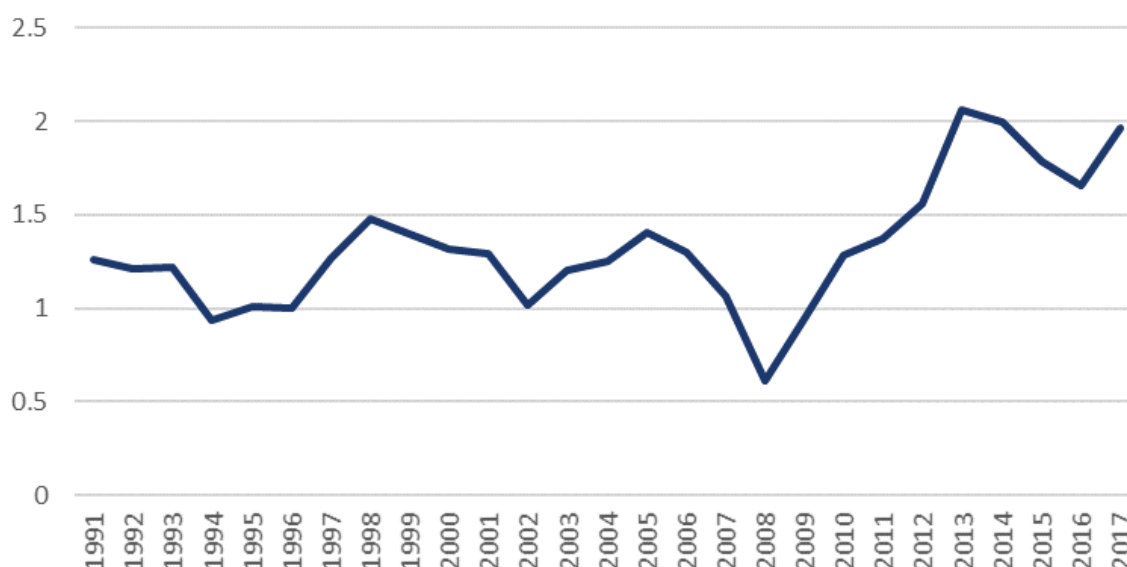
Figure 2.2: Average Tobin's q for S&P500 Index firms, 1964 to 2017



Source: Ryan Peters, co-author of *Peters and Taylor* (2017)

In the next two figures we display the average Tobin's q for members of the S&P500 "Consumer Discretionary" and "Consumer Staples" sub-indices since 1991. The former GICS category,<sup>28</sup> Consumer Discretionary which is displayed in Figure 2.3, is the one that contains retail fuel outlets, and is therefore most relevant to Z Energy. For that industry we find that Tobin's q was not affected by the dot-com boom, and averaged at approximately 1.25 during the period prior to the global financial crisis. However, after falling below 1.0 during 2008, this industry's average q has risen strongly and in recent years has been averaging between 1.75 and 2.0.

**Figure 2.3: Average Tobin's q for S&P500 Index Consumer Discretionary firms, 1991 to 2017**



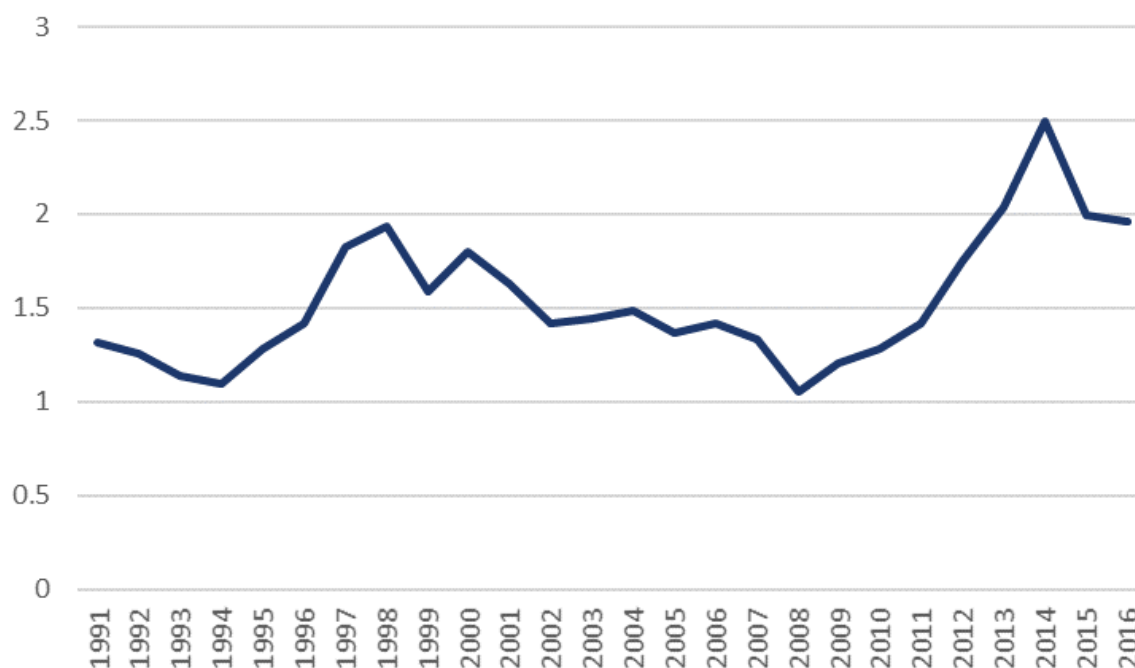
Source: Ryan Peters, co-author of *Peters and Taylor* (2017)

Figure 2.4 shows the average Tobin's q for firms in the Consumer Staples sub-index of the S&P500 Index. Tobin's q for these firms was also less affected than the S&P500 Index as a whole by the dot-com boom and bust but remained at a relatively higher level than for Consumer Discretionary firms, and didn't fall below unity, even in the global financial crisis. However, post-2009 these businesses also exhibited a strong growth in Tobin's q, in concert with Consumer Discretionary firms and the S&P500 Index as a whole. In recent years the average Tobin's q value for this sub-index has been in the range of 2 to 2.5.

The conclusion that can be drawn from a review of the Tobin's q for these indexes is that q is volatile over time and does not necessarily centre around unity. Only during unusual periods in the 1970s and the global financial crisis has q dipped below unity.

<sup>28</sup> The Global Industry Classification Standard (GICS) is the basis on which firms in the Standard & Poor's and MSCI market indexes are assigned to industry sub-groups.

Figure 2.4: Average Tobin's q for S&P500 Index Consumer Staples firms, 1991 to 2017



Source: Ryan Peters, co-author of Peters and Taylor (2017)

### 2.3.3 The Commerce Commission's previous views on volatility in markets

The Commission's own past statements show that it has previously not been particularly convinced that workably competitive markets deliver a market value equal to replacement cost, e.g.:<sup>29</sup>

*Asset values in particular vary in light of changing expectations about the future, not simply in light of changes in replacement costs today.*

*Empirical evidence supports this conclusion. It demonstrates that while asset values in workably competitive markets characterised by specialised assets may occasionally converge with replacement costs, they only very rarely if ever equate and will normally diverge by a significant amount for a prolonged period of time, including in some cases indefinitely. The extent and duration of any deviation will be influenced by, amongst other things, any arrangements that have shaped the relationship between suppliers and their consumers. [emphasis in original]*

This view was accepted by the merit review body:<sup>30</sup>

*[524] We consider that it would be wrong to suggest that workably competitive markets tend towards long-term equilibrium, in the sense that markets will reach such equilibrium and then*

<sup>29</sup> Quoted in Wellington International Airport Ltd & Ors v Commerce Commission [2013] NZHC [11 December 2013], para.521.

<sup>30</sup> Wellington International Airport Ltd & Ors v Commerce Commission [2013] NZHC [11 December 2013], paras.524-525.

*tend to stay there or thereabouts, or even get ever closer to it. To the extent that Mr Balchin said that, he was in our view incorrect. But Mr Balchin made it clear that he was appealing to the properties of long-run equilibrium, not claiming that long-run equilibrium was itself some sort of goal to be reached if only sufficient time may pass.*

*[525] Long-run equilibrium is a theoretical concept with certain properties. It is long-run equilibrium market outcomes that are considered to be the socially desirable product of workably competitive markets. The fact that workably competitive markets never reach such equilibrium is not the point. They tend towards producing the outcomes associated with long-run equilibrium.*

## **2.4 Tobin's q interpreted in a regulatory context**

Another cross-check on the apparently volatile results shown above for unregulated businesses is to compare the evidence on the “regulatory q” – being the ratio of the market value of regulated assets and their regulatory asset base. This shows that even for firms whose prices are set as a mechanical function of book value (at replacement cost), their market value (and “q”) can still vary considerably and be much larger than 1.

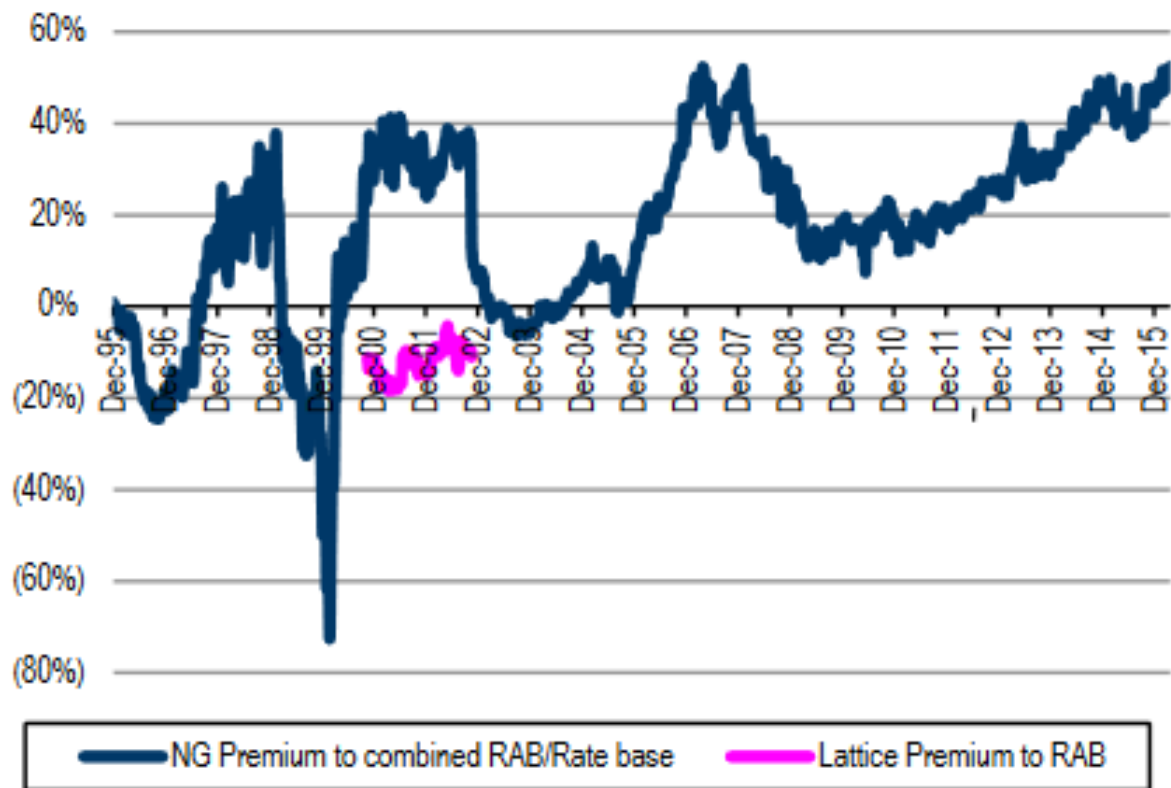
The UK's Office of Gas and Electricity Markets (Ofgem) is the main regulator of the assets of National Grid PLC. In April 2016, Credit Suisse noted that it was trading at a 1.47 EV/RAB multiple.<sup>31</sup> In its research report Credit Suisse references a “valuation cycle” that results in elevated EV/RAB multiples,<sup>32</sup> noting that it believed that National Grid was at such a peak, having previously reached a similar peak on the eve of the global financial crisis, and that United Utilities had been sold at a 1.45 multiple in November 2007. National Grid reached a peak EV/RAB multiple of 1.54 on 19 January 2008 and after falling to approximately 1.2 during the global financial crisis recovered to 1.47 by March 2017. That is, since the end of the global financial crisis the rise in National Grid's EV/RAB multiple has been similar to the rise in the average Tobin's q ratio observed for the S&P500 Index firms and firms in the consumer industries shown above.

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<sup>31</sup> Credit Suisse (27 April, 2016) *National Grid*, Europe/United Kingdom Equity Research.

<sup>32</sup> Credit Suisse (27 April, 2016), p.19.

Figure 2.5: National Grid - Premium to combined RAB and rate base



Source: Thomson Reuters Datastream, Credit Suisse estimates, Credit Suisse Equity Research

Source: Credit Suisse (27 April, 2016), p.23

## 2.5 Conclusion

The Commerce Commission's current approach, which considers a Tobin's q of unity to be the benchmark against which firm performance should be assessed is the opposite of views that it had previously expressed but aligns with L&R's approach in 1981.<sup>33</sup> We have seen that L&R failed to find a meaningful relationship between its Tobin's q measure and measures of market power such as the Lerner Index and the 4-firm concentration ratio.

Theory suggests there are sound reasons to expect that both competitive and monopoly-regulated firms may at times exhibit Tobin's q values materially above unity. We have discussed how since L&R's research was undertaken there have been material advances in the measurement of q, with the cTobin's q measure used by P&T now acknowledging that approximately half of business's capital is intangible and that to ignore it will invite error. Empirically we found that Tobin's q, taking account of intangibles and measured over a much longer period than that observed by L&R, to be highly unstable, and to be materially higher than unity for the average S&P500 firm (and for the average in the most relevant in the current market).

<sup>33</sup> Commerce Commission (20 August, 2019), p.294.

Hence, we conclude there is no valid reason for the Commerce Commission to test Z Energy's current Tobin's q value against a benchmark value of unity.

### 3. Measuring Z Energy's Tobin's q

#### 3.1 Introduction

In this section we review the method that was applied by the Commerce Commission used to estimate Tobin's q. We have assessed the Commerce Commission's method against the benchmark of an efficient new entrant firm and consider that several material technical and conceptual errors have been made. We discuss each error in turn, and then summarise their individual and combined impact on the measurement of Tobin's q for Z Energy.

#### 3.2 Number of Z Energy shares

The number of shares is over-stated – The Commerce Commission has applied 429 million shares to calculate the market value of Z Energy's equity when the actual number is 400 million. This results in an over-statement of market value by \$181.5 million.

#### 3.3 “Depreciation” applied to calculate the “depreciated replacement cost” estimates

As discussed above, for the denominator of the Tobin's q calculation, the Commission has applied the estimates of depreciated replacement cost that Z Energy has used in its own financial accounts for financial accounting purposes.<sup>34</sup> In our view, the application of the depreciated replacement costs from Z Energy's financial accounts is likely to understate the value that it is appropriate to apply in a Tobin's q calculation.

Our reason for this is because estimates of depreciated replacement cost for financial accounting purposes typically employ the straight-line method of depreciation. This method of depreciation is appropriate for financial accounting purposes for assets whose service potential and utilisation is expected to be (approximately) constant over its life.<sup>35</sup>

The correct method of depreciation for economic purposes, however, is to adjust the estimates of replacement cost to reflect the difference between the forward-looking costs and service potential of using the existing (“old”) assets to provide a service compared to the forward-looking costs and service potential of using the replacement (“new”) assets for this purpose. This calculation provides the correct estimate of the amount that a hypothetical (efficient) new entrant would pay for the existing assets if it has the choice of replicating the assets – that is, their second-hand value if there was a competitive market for the assets. For the very simple case where the only meaningful difference between the “old” and “new” assets is their remaining lives, the discount that would exist for “old” assets would merely reflect the time-value benefit arising from the replacement of the “new” asset being more distant in time than for the “old” asset, and it is straight-forward to show that the appropriate depreciation method in this case is annuity depreciation rather than straight line

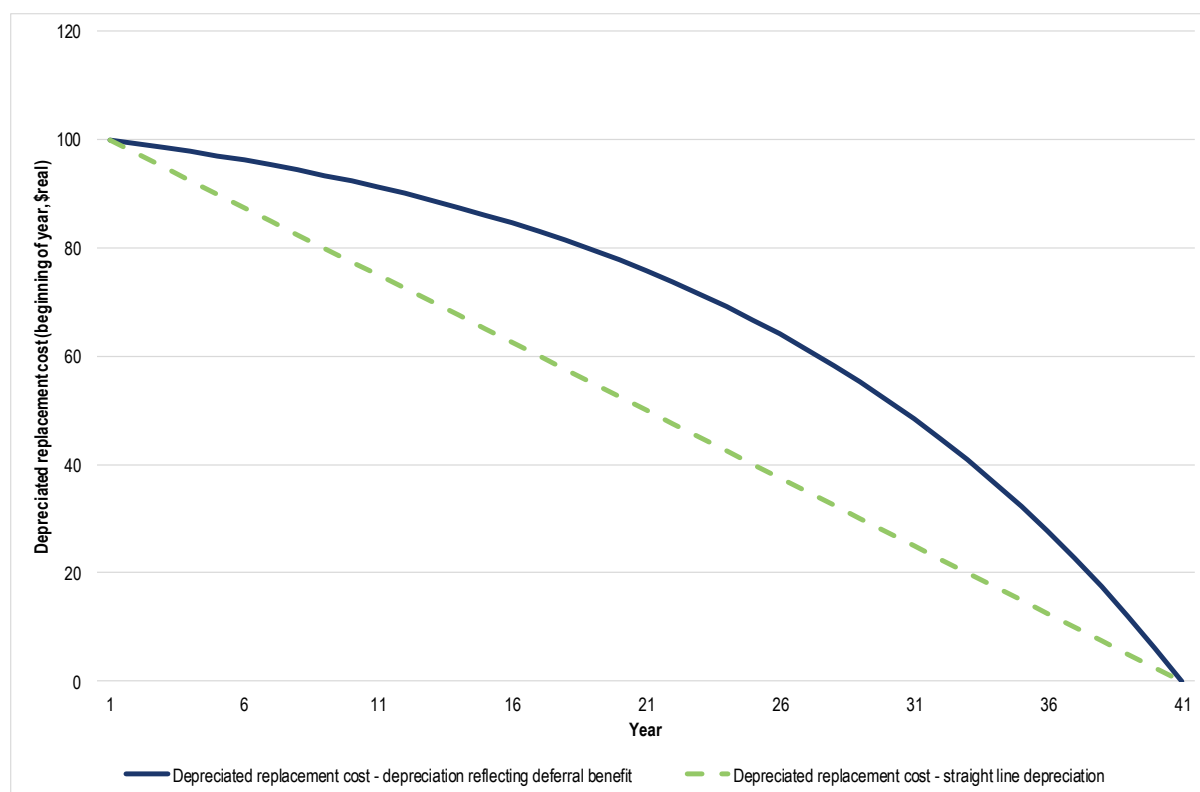
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<sup>34</sup> We observe that the depreciated replacement cost figures that the Commission applied formed the lower end of the range for Tobin's q that the Commission reported, with the upper end reflecting the undepreciated replacement costs.

<sup>35</sup> This is consistent with the requirement in the accounting standard that “[t]he depreciation method used shall reflect the pattern in which the asset's future economic benefits are expected to be consumed by the entity” (NZ IAS 16, para.60).

depreciation. The difference between using these depreciation methods can be material – in the simple example shown below, for an asset that is half way through its life, the correct estimate of depreciated replacement costs for Commission’s purpose would be more than 50 per cent higher than the straight line value (and with this margin increasing over the remaining life of the asset).<sup>36</sup>

**Figure 3.1: Depreciation reflecting deferral benefit vs. Straight line depreciation**



For the case of Z Energy, however, there is an additional reason to believe that applying straight-line depreciation is inappropriate. One of Z Energy’s principal classes of physical assets are terminals, which are maintained in an as-new condition and so deliver a constant service potential consistent with the assumptions in the simple model above. In addition to this, it is unlikely that Z Energy’s terminal assets would ever be replaced, given the (reasonable) expectation that the assets in question will remain serviceable for the remaining term of the retail fuel sector. In this circumstance, there is no obvious forward-looking cost advantage from using “new” assets rather than “old” assets, and so no depreciation would be applicable.

### 3.4 Market value should not be adjusted for the deferred tax liability

In our view the Commerce Commission overstates Z Energy’s market value by adding to market value \$71 million for deferred tax liability, which is taken at half of the balance sheet value to “approximate a Net Present Value”.

<sup>36</sup> This figure assumes a cost of \$100 that remains constant in real terms, a 40 year asset life and a real discount rate of 8 per cent.



We have been unable to find any support in the Tobin's q literature for making an adjustment to the market value of the enterprise to reflect a deferred tax liability. As such, making this adjustment raises issues with comparing the calculated Tobin's q for Z Energy to other estimates of Tobin's q (such as those that we presented in the previous chapter).

We note further that the Commission's (unstated) justification for adding back part of the deferred taxes to the denominator would appear to be to make Z Energy's enterprise value more consistent with that of a new entrant. To this end, the assumption in the Commission's analysis is that a new entrant would have a lower effective tax rate (reflecting the assumption that accelerated depreciation exists for the relevant assets under New Zealand tax law) than an existing firm.

However, most (about 75 per cent) of the deferred tax balance reported in Z Energy's 2019 financial report relates to the "contracts acquired" intangible asset category, which reflects the value of the contracts that Z Energy acquired as part of the Chevron transaction.<sup>37</sup> The Commission has excluded any allowance in respect of these contracts from the denominator of its Tobin's q calculation on the basis that the Commission does not believe that a new entrant would need to construct any physical assets in order to replicate the underlying revenue stream. While we disagree with the Commission's exclusion of the assets associated with these contracts (see the next section below), it would be inconsistent to seek to recognise a tax advantage to a new entrant in the numerator if the physical assets required to obtain that tax advantage are excluded from the denominator.<sup>38</sup>

Reflecting on the potential for comparability issues discussed above, combined with the fact that about three-quarters of the deferred tax balance in Z Energy's financial accounts is associated with assets the Commission has excluded from the Tobin's q calculation, we recommend not making the deferred tax balance adjustment to the numerator.

### 3.5 Under-allowance for brand and organisational capital

The Commerce Commission has allowed \$261 million for "software, brands and other intangibles" in the denominator of q, and has omitted another \$158 million of "goodwill" associated with the purchase of Chevron in 2017.<sup>39</sup> However, for decades academic research finds that a substantial portion of what firms' report as operating expenditure is, in reality, the development of intangible assets in the form of organisation capability, human capital and brand.<sup>40</sup> A new entrant into an industry would need to replicate this intangible capital in order to compete.

To estimate the value of internally generated intangible capital, Peters and Taylor (2017) used a commonly applied benchmark, which is to treat 30 per cent of Selling, General and Administrative

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<sup>37</sup> This can be deduced from Notes 9 and 12 to Z Energy's 2019 financial accounts.

<sup>38</sup> Under the Commission's logic, a new entrant would not need to install physical assets to obtain the revenue associated with the "contracts acquired" intangible asset, and so there is no possibility that the new entrant could obtain a tax advantage over the incumbent (i.e., the tax advantage is the benefit of accelerated depreciation, which can only be realised if there is physical investment).

<sup>39</sup> We consider separately below the issue of the "contracts acquired" as part of the Chevron acquisition, which we conclude are associated with tangible assets.

<sup>40</sup> For example, Hall, Robert E., (December, 2001), "The Stock Market and Capital Accumulation", *American Economic Review*, Vol. 91, No. 5, pp. 1185-1202; and Peters, Ryan H., and Lucian A. Taylor, (2017), "Intangible capital and the investment-q relation", *Journal of Financial Economics*, Vol. 123

Expense (SG&A) as investment in brand development, organisational development and human capital, which is also assumed to depreciate this over 5 years. Applying this approach, and taking the \$205 million in SG&A that Z Energy reported in 2018 as a guide produces an estimate of unbooked steady-state intangibles investment in the order of \$154 million.<sup>41</sup> This value is materially the same as the \$158 million in “Goodwill” booked in connection with the Chevron acquisition.<sup>42</sup>

In our view, adding back the \$158 million Chevron “Goodwill” to the \$261 million that the Commerce Commission has applied would provide an appropriate allowance for Z Energy’s internally generated intangible assets.<sup>43</sup>

### 3.6 Contracts acquired from Chevron

The Commission has excluded the intangible asset that is labelled “contracts acquired” from the denominator of its calculation on the basis that a new entrant would not need to construct any physical or other assets in order to replicate this revenue stream.

According to our understanding of the economic substance of the arrangements that underpin these contracts, this assumption of the Commission’s is incorrect.

As we understand the nature of the events that gave rise to these contracts, Chevron created physical assets and struck contracts that recovered their cost (i.e., delivered a return on and return of capital). While the legal title was then transferred to the counterparty – which is why they are not reported as a tangible asset on Z Energy’s balance sheet – the economic substance is that Chevron (and subsequently, Z Energy) remained the asset owner. More importantly:

- if a new entrant sought to replicate the revenue stream in these arrangements, it would need to construct the underlying physical assets, and
- the fact that the revenue stream underpinning these contracts included a “return on and return of” capital that was funded by Chevron means that there is a material inconsistency if there is no allowance included in the denominator for the cost of the underlying assets – the fact that the legal title to the underlying assets may not reside with Z Energy is not relevant to the economic substance of the arrangements.

While we have not been able to obtain an estimate of the replacement cost of these assets in the time available to make submissions, we recommend including the intangible asset as a proxy for the cost of

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<sup>41</sup> This \$154 million reflects the steady-state intangible capital that would accumulate of 30 per cent of \$205 million (\$61.5 million) was invested each year and depreciated on a straight-line basis over 5 years (with half a year of depreciation applying to the expenditure in the first year).

<sup>42</sup> In section 2 we presented academic evidence from Crouzet and Eberly (May, 2018), who considered that the goodwill component brought onto the books of acquiring retail businesses were a reflection of previous investments that the acquired firms had made in intangibles such as brands, systems and organisational capital.

<sup>43</sup> In section 2 we presented academic evidence referring to a benchmark intangible capital intensity level of 43 percent. While that work is very relevant at illustrating the growing importance of intangible assets in businesses generally, applying that benchmark to Z Energy would imply an intangible capital estimate exceeding \$800 million. We think this quantum is implausible, and most likely reflects differences in the relative importance of tangible assets between businesses from which the benchmark was derived and Z Energy.

the physical assets.<sup>44</sup> However, we note that the replacement cost of the underlying assets could be higher or lower than this amount, that is:

- if the contracts contained substantial “monopoly rents” then the intangible asset value could be higher than the replacement cost of the underlying physical assets, however
- the contracts relate to assets that were constructed some time ago and are being amortised by Z Energy on a straight line basis, and so the asset cost that was applied in the contracts may understate the current replacement cost, and the subsequent amortisation of the intangible asset value may overstate the economic depreciation of the underlying physical assets, both of which would imply (all else constant) a replacement cost above the intangible asset value.

### 3.7 Proper recognition of assets subject to an operating lease

In relation to the assets that are the subject of operating leases, the Commission has included the same amount in the numerator and denominator, namely the present value of remaining lease payments (as per Z Energy’s financial accounts). However, this treatment is incorrect.

- The Commission’s treatment of operating leases in the numerator is correct, and is directly comparable to how debt is treated (i.e., the lessor is treated as another party with an interest in the enterprise, and so the value of its interest is included in enterprise value).
- However, for the denominator, the correct approach would be to include the replacement cost of the underlying assets. Again, this is directly comparable to how assets that are financed through debt are treated – the value of debt is included in the numerator, but the current replacement cost of the assets is included in the denominator).

We have not been able to obtain an estimate of the replacement cost of these assets in the time available to make submissions.

### 3.8 Cost premium for the new entrant

Lastly, it is plausible that Z Energy may have a range of other advantages over a new entrant, which would imply that the replacement cost of Z Energy’s assets may understate what it would cost a new entrant to enter the market.

One possible example is that Z Energy and the other incumbent participants have secured the best sites from a logistics or customer convenience or cost perspective, so that the next sites to be developed would have a lower value (either implying higher cost for the site or to the network, or lower revenue generation). A second possible example is that the incumbents enjoy lower environmental and other standards than those to which a new entrant would be subject.

For the Tobin’s q estimate accurately to test whether new entry would be possible, the denominator should reflect the situation of a new entrant, which would require an adjustment to Z Energy’s

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<sup>44</sup> As well as adding the “contracts acquired” intangible asset to the denominator, we have re-included the deferred tax balance adjustment the Commission made to the numerator to be consistent with our argument above although, as we discussed above, the deferred tax balance adjustment may create problems with comparability to other benchmarks for Tobin’s q.

replacement cost estimates to the extent necessary. While we note that this adjustment may imply that rents are available to the incumbents, any rents attributable to having secured better sites or lower environmental or other standards are inframarginal rents, rather than rents that would accrue to the marginal producer.

Again, we have not been able to obtain an estimate of the greater asset cost that a new entrant would bear relative to Z Energy in the time available to make submissions.

### **3.9 Summary: Impact of technical and conceptual errors on estimates of Tobin's q**

In this section we draw together the implications of the technical and conceptual errors identified above and present them in a single table below. There we show the successive impact on the estimate of Tobin's q for Z Energy in March 2019 when corrections are made. The alternative estimates of Tobin's q are:

- 2.05 – based on the Commerce Commission's draft report.
- 1.95 – when the corrected market capitalisation is applied.
- 1.57 – when economic depreciation is used (which we assume to be zero).<sup>45</sup>
- 1.47 – when a more reasonable allowance is made for Z Energy's intangible assets.
- 1.44 – when the impact of the deferred tax liability is removed.
- 1.28 – when an allowance for the assets associated with the Chevron contracts is included.

Moreover, we observe that these estimates do not account for the two additional factors that may reduce the estimated Tobin's q for Z Energy even further (but which we have not been able to quantify in the time available for submissions), namely:

- the likely premium of the replacement cost of Z Energy's leased assets over the lease liabilities, and
- the potential for Z Energy to have a cost advantage over a new entrant.

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<sup>45</sup> For the purpose of this report, we have back-calculated the replacement cost of Z Energy's specialised assets from the mid-point of the range for the Tobin's q values the Commission reported in Table D7.

**Table 3.1: Re-worked estimates of Tobin's q for Z Energy at 31 March, 2019**

	[1]	[2]	[3]	[4]	[5]	[6]
	Commerce Commission	Fix number of shares	Apply economic not accounting depreciation	Appropriate allowance for intangibles	Delete deferred tax balance adjustment	Include assets associated with Chevron contracts
Numerator (\$m)	3,850	3,668	3,668	3,668	3,597	3,668
Denominator (\$m)	1,880	1,880	2,333	2,491	2,491	2,871
Tobin's q	<b>2.05</b>	<b>1.95</b>	<b>1.57</b>	<b>1.47</b>	<b>1.44</b>	<b>1.28</b>

Source: Commerce Commission, Z Energy 2019 annual report and Incenta analysis

### 3.10 Conclusion

In section 2 above we demonstrated that both on theoretical and empirical grounds it is not appropriate to assess the effectiveness of competition based on a target Tobin's q value of 1, and that for most firms in the S&P500 Index Tobin's q ratios are currently elevated relative to historical experience. In this section we showed that the Commerce Commission's estimate of q for Z Energy was in error due to a number of technical and conceptual errors. Correcting for those errors we have shown that more plausible Tobin's q value for Z Energy is 1.28, and that there is also a plausible basis for considering that the true value may be lower still.

These Tobin's q values are lower than the recent average Tobin's q's observed for the S&P500 Index and the S&P500 Consumer Discretionary sub-index (the latter of which is particularly relevant to Z Energy). Thus, in our view, it is difficult to conclude from an analysis of Tobin's q that Z Energy is earning monopoly rents.