Journal of Regulatory Economics; 27:3 281–307, 2005

Price-Cost Margins and Profit Rates in New Zealand Electricity Distribution Networks Since 1994: the Cost of Light Handed Regulation*

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Abstract
From 1994 to 2003, New Zealand's corporatized electricity lines networks operated with no industry regulator, but under the spotlight of mandatory information disclosure. As a result there exists a large body of detailed, audited and publicly available accounting data on the financial performance of these businesses. Using that data, this paper finds that price-cost margins have widened substantially since deregulation. We estimate the extent to which "light-handed regulation" has allowed profits to exceed the levels which would have been acceptable under the old rate-of-return regulatory framework, and find that the answer is about $200 million per year, on an ongoing basis.

Key words: market power electricity industry deregulation, utility regulation, excess profits

JEL Classifications: D21; K23; L11; L43; L51

1. Introduction

Over the past decade, many countries around the world have restructured their electricity industries. Common elements have been privatization of formerly publicly-owned suppliers, breakup of monopolies, introduction of spot markets for short-run pricing and scheduling, and a variety of new regulatory arrangements to limit the exercise of market power in the new market environment.

* We thank colleagues at Victoria University, and two anonymous referees for this journal, for constructive comments on this paper. Any remaining errors are entirely our responsibility.

A rapidly growing literature has documented the exercise of market power by large firms on the supply side of the industry, most notably in the UK (Newbery and Pollitt 1997; Wolfram 1999; Newbery 2002) and California (Joskow 2001; Borenstein et al. 2002; Joskow and Kahn 2002; Bushnell 2003). The common theme of these studies has been that prices have been consistently above the level predicted by competitive models of the market—that is, that price-cost margins have been larger than required to sustain the supply side of the industry, and there have been significant transfers of wealth from electricity consumers to electricity suppliers. Several writers have noted also the widespread tendency for both policymakers and regulators in various countries to be captured by vested interests on the supply side of the industry, a process which has hindered the evolution of effective regulatory arrangements to protect consumers against monopoly pricing.

While the recent literature has focused on the market power of generators,[1] the same concerns arise with the lines networks which distribute electricity to final users. These are classic natural monopolies with large economies of scale, well placed to defend their market dominance while using their market power to impose large margins of price over cost. The only restraint on such exercise of market power in New Zealand prior to 2003 was a regime of "light handed regulation" established in the early 1990s.

The New Zealand approach to electricity deregulation was unusually radical in the extent to which it relied upon self-regulation to curb monopolistic behavior. Hogan (2002, p. 124) has described the New Zealand approach as a "distinctive attempt to create regulation without regulators". The natural-monopoly electricity transmission and distribution networks were compulsorily separated from generation and retailing (which were considered to be workably competitive or contestable) and were made subject to mandatory information disclosure. With no regulator, the regime relied heavily on the Government's declared expectation that self-regulation would result simply as a result of transparency (Energy Policy Group, 1995; Pickford, 1996).

The economic literature on mandatory disclosure has generally been skeptical of the power of disclosure on its own to curb monopoly. Foster (1992, Chapters 1 and 7) provides a lucid discussion of the origins of what he calls "sunshine regulation" in the UK, but does not suggest that disclosure could be a substitute for a regulator. Martin (1998, p. 106) has drawn attention to the possibility that information disclosure may function more as a coordinating device for collusion than as a discipline on market power. Shaffer (1999, p. 183) notes that "disclosure requirements remain a major public policy tool, especially in the financial services industry, and are frequently viewed as a market-oriented alternative to traditional

1 This is because most countries retain price-cap or rate-of-return regulation of their natural monopoly transmission and distribution networks, on the basis that market power is uncontroversially present in those industry segments. Interest overseas has therefore focused on whether competitive conditions prevail in deregulated generation. Only New Zealand has deregulated its networks, making the presence and exercise of market power an issue.

regulation", but concludes that mandatory disclosure appears to have had no effect in disciplining the credit card market. Stefanadis (2003) argues that self-regulation can be expected to work best (if at all) where the relevant industry is undergoing rapid innovation, and where government is an active enforcer (neither of these conditions has been met in electricity distribution networks in New Zealand), but finds that even in the US financial services sector where both innovation and government oversight are present, self-regulation has had little if any effect.

The power of information disclosure to affect the behavior of monopolies operating under New Zealand law is further weakened, relative to other jurisdictions, by the fact that the taking of monopoly profits is completely legal. Both the Commerce Commission (1994) and the courts[2] have unequivocally taken the position that under the Commerce Act 1986, wealth transfers from consumers to monopolies are welfare-neutral and involve no detriment to society. The only sanction faced by a network owner which discloses high monopoly rents has been the threat of retrospective Government intervention on a case-by-case basis. No such intervention has occurred to date.

This paper uses the annual financial information disclosed by electricity distribution networks, combined with information from company annual reports and other public sources, to review the evolution of price-cost margins in New Zealand lines businesses since deregulation, and hence to compare the outcomes of deregulation with those which a rate-of-return regulator would have allowed. Tirole (1994, p. 533) has suggested that "incentive schemes of regulation have been to a large extent developed separately from the auditing procedures." Our hope is that the auditing exercise undertaken below will contribute to future regulatory design by illustrating some of the problems encountered in the course of New Zealand's experiment with self-regulation under mandatory information disclosure.

2. Background

Electricity lines networks in New Zealand were originally developed by two types of electricity supply authorities (ESAs): council-owned Municipal Electricity Departments in most major cities, and Electric Power Boards (statutory entities run by elected boards, with exclusive regional franchise areas, set up under the Electric Power Boards Act 1918) in other areas. The Energy Companies Act 1992 forced all these supply authorities to corporatize, and the Electricity Industry Reform Act 1998 compelled them to divest their former energy-trading activities in order to focus solely on the natural-monopoly business of operating their networks.[3]

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2 Most recently in *Air New Zealand and Qantas Airways Ltd v. Commerce Commission and Others*, High Court CIV 2003 404 6590, judgment of 17 September 2004, paragraph 241.

3 A chronological summary of reforms in the electricity sector is available on the website of the Ministry of Economic Development, http://www.med.govt.nz/ers/electric/chronology/index.html.

One policy goal at the time of deregulation was to foster amalgamation of territorial franchise areas to capture cost efficiencies arising from economies of scale and scope (Giles and Wyatt 1989). This process had led by 2002 to the emergence in the North Island of three large companies (Powerco Ltd, Vector Ltd, and United Networks Ltd) coexisting with a fringe of smaller independent networks owned by consumer trusts. In the South Island the municipally owned operations in Christchurch (Orion Ltd) and Dunedin (Dunedin Electricity) had absorbed some neighboring networks, while trust-owned networks continued to supply the rural and small-urban market.

A second ostensible goal of network industry restructuring was that the cost efficiencies resulting from corporatization and deregulation should be passed through for the benefit of the wider economy, rather than retained as monopoly rents. This was usually expressed in terms of a desire to see "outcomes which mimic those of a competitive market". In this paper we set up a competitive benchmark and use it to evaluate the extent to which information disclosed under the Electricity (Information Disclosure) Regulations[4] reveals the exercise of market power to recover monopoly rents.

3. A Pricing Model

We begin from a conventional markup-pricing model:

$$p = c + \frac{F}{q} + t \Rightarrow p - c = \frac{F}{q} + t, \tag{1}$$

where p is price, c is average operating cost (comprising both variable costs and operational overheads such as office rentals and managerial salaries),[5] t is tax expense averaged over volume, and q is volume of output (which is here measured by kWh of electricity conveyed over the lines). F is the "warranted" annual revenue corresponding to the firm's capital costs (interest on loans and a competitive return on equity) plus its target level of economic profit.

For the purposes of the discussion later in the paper, it is convenient to disaggregate F into four components:

$$F \equiv k \cdot A + (D - \mathrm{REV}) + \Pi, \tag{2}$$

where k is the cost of capital for the firm, A is the value of fixed assets, D is depreciation expense, REV is asset revaluations (negative depreciation), Π is economic

4 The regulations were promulgated in 1994, revised in 1999, and finally revoked in April 2004, as a newly-established industry regulator, the Electricity Commission, took over responsibility for monitoring network prices.

5 The available data does not permit operating costs to be disaggregated between variable (avoidable) costs and overheads for the full period analysed in this paper. Ideally overhead costs should be in the markup, but none of the conclusions reached in this paper are affected by their inclusion in cq.

profit. Under competitive conditions or strict rate-of-return regulation, $\Pi = 0$ and the price-cost margin simply recovers the cost of capital.

For given F, t and q, p will move one-for-one with c. Increases in q, other things equal, reduce the markup and so should reduce p.

In the New Zealand electricity networks industry, volumes have increased and average operating costs have fallen since restructuring. Average operating costs plus tax expense have also trended down. Meantime the physical asset stock has remained effectively unchanged and the weighted average cost of capital has fallen. In terms of equation (1), these trends should show up as price reductions. The next section shows that, on the contrary, p has increased. The following section focuses on the changes in F which have underpinned the observed increase in the industry's price-cost margin.

4. Price-Cost Margins 1990–2002

4.1. Data

Electricity lines companies generally charge for their services by means of multi-part tariffs. The present study abstracts from tariff detail and measures price by average revenue. This is calculated by taking total revenues from lines charges and other revenues directly related to the lines businesses, and dividing these revenues by the total volume of electricity conveyed over each network in the course of the year. In order to focus solely on the returns from owning and operating lines networks, the revenue series used excludes interest income, dividend income, profits/losses on purchase and sale of assets, and the transmission-charge component of the retail electricity price, which for distribution networks is simply a pass-through to the grid owner Transpower Ltd.

Variable (avoidable) cost is represented by reported total operating expenses excluding transmission charges, depreciation, interest, tax, and expenditure on activities unrelated to the delivery of lines services.[6] In the case of Vector Ltd, the extraordinary costs incurred to deal with a complete failure of supply to the central business district of Auckland City in 1997–1998 have been included in operating costs for that and subsequent years.

Data for the financial years 1995–2002 comes from the annual financial statements which each lines company was required to publish under the Electricity (Information Disclosure) Regulations 1994 and 1999. The regulations were designed to provide ring-fenced accounts for the natural-monopoly lines businesses of each company, with the aim of, *inter alia*, enabling customers and analysts to identify any excess profit component in lines pricing. Disclosure practices have varied among companies in terms of the amount of detail provided and of the extent

6 An example of this last category is $7.3 million spent by Powerco in the 2001 financial year on "takeover defence expenditure" and disclosed as part of that company's operating expenses for that year (Powerco 2001 financial disclosure note 15 line 12(l)).

to which so-called "generally accepted accounting practice" has been exploited to conceal certain aspects of performance.[7] Careful reading of the notes to the accounts, and consistency checks with the separately-published company annual reports, have filled in most of the gaps, but occasionally figures have had to be estimated or interpolated for individual years.[8]

For the earlier years 1961–1994, financial results on a cash basis for individual ESAs were published in the *Electricity Industry Statistics* produced by the Ministry of Commerce and its predecessors; data have been taken from this source for the period 1990–1994. The old statistics did not fully ring-fence network operations from energy and appliance trading activities, but they do contain enough detail to separate out generation activities and to subtract out the wholesale cost of electrical energy (the former bulk supply tariff, BST) from company revenues and costs, leaving a "gross margin" comprising the revenues and costs associated with operating the networks, billing customers, and operating appliance showrooms, plus the retail markup on electrical energy. Hence network profits prior to 1995 are slightly overstated in our tables due to inclusion of the retail energy margin; this bias strengthens the conclusions drawn below.

The data up to 1994 can be linked to the disclosure series starting in 1995 for the purpose of tracing time-trends in price and costs. Tables 1–4 set out the results for the four largest companies. Table 5 presents aggregated data for the remainder of the industry, and Table 6 shows the national totals. Assembling these tables from the annual disclosures and annual reports has involved considerable time and effort, particularly the preparation of consistent consolidated accounts for United-Networks and Powerco—two large lines businesses formed by a series of mergers and takeovers of numerous smaller companies.

The 1994–1995 transition from the old to the new data series for most companies exhibits the expected discontinuity in reported operating costs between 1994 (when all ESA costs were included) and 1995 (when network costs were separately reported), but this does not affect the longer-run trends in the tables. While the 1995 restructuring of disclosure accounts has to be borne in mind, it cannot on its own account for the picture that emerges from the twelve years of data presented.

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7 The treatment of asset revaluations under generally accepted accounting practice (GAAP) in Australia and New Zealand raises a number of issues with a strong resemblance to problems recently uncovered in the USA (Healy and Palepu 2003; Lev 2003).

8 The main area of estimation is transmission charges, which not all companies disclosed for the years 1995 to 1998. A detailed appendix on the estimation of transmission charges by company is available on request from the authors. We have filled in the gaps by combining information from companies which did disclose their transmission costs with Transpower's own disclosed revenue total to allocate charges across non-reporting companies. In addition we have used interpolation to make up for gaps in the disclosed revenue and depreciation for UnitedNetworks in the year to March 1999, and estimates of interest expense for Horizon and Dunedin 1995–1999. None of these makes any significant difference to the results of the study.

Table 1. Revenues, Expenses, and Operating Surplus for UnitedNetworks and its Predecessor Companies[1], 1990–2002

	1990	1991	1992	1993	1994	1995	1996	1997	1998[2]	1999[2]	2000	2001	2002
$ million													
Revenue excl Transpower charges	137.8	152.8	163.2	185.8	180.1	176.5	191.8	233.5	260.6	272.3[2]	284.0	289.9	310.6
Operating Costs	91.2	94.0	105.8	113.9	103.2	76.3	80.1	95.7	86.2[2]	76.8[2]	63.2	63.7	61.0
Depreciation	18.7	19.7	20.8	21.6	25.7	26.6	35.7	39.4	43.6	43.0[2]	42.5	42.9	45.1
Total Operating Expenses excl Transpower Charges	109.9	113.7	126.7	135.4	128.9	102.9	115.8	135.1	129.8	119.8	105. 6	106.6	106.1
Pre-tax Operating Surplus	27.9	39.1	36.6	50.3	51.2	73.6	76.0	98.4	130.8	152.4	178.3	183. 3	204.6
Tax Expense	8.1	11.2	11.0	19.9	24.4	25.4	27.2	28.6	25.1	28.9	26.3	26.7	40.0
Post-tax Operating Surplus	19.7	27.8	25.6	30.4	26.8	48.3	48.8	69.8	105.7	123.5	152.0	156. 6	164.6
Electricity Conveyed, GWh	5,491	5,645	6,180	5,564	5,871	5,776	6,483	6,726	6,731	6,318	6,555	6,740	7,283
Average figures, cents per kWh conveyed													
Average Revenue c/kWh	2.5	2.7	2.6	3.3	3.1	3.1	3.0	3.5	3.9	4.3	4.3	4.3	4.3
Operating Costs	1.7	1.7	1.7	2.0	1.8	1.3	1.2	1.4	1.3	1.2	1.0	0.9	0.8
Depreciation	0.3	0.3	0.3	0.4	0.4	0.5	0.6	0.6	0.7	0.7	0.6	0.6	0.6
Total Operating Expenses excl Transpower Charges	2.0	2.0	2.0	2.4	2.2	1.8	1.8	2.0	1.9	1.9	1.6	1.6	1.5
Average Pre-tax Operating Surplus c/kWh	0.5	0.7	0.6	0.9	0.9	1.3	1.2	1.5	1.9	2.4	2.7	2.7	2.8
Average Tax Expense	0.1	0.2	0.2	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.4	0.4	0.5
Average Post-tax Operating Surplus	0.4	0.5	0.4	0.5	0.5	0.8	0.8	1.0	1.6	2.0	2.3	2.3	2.3
Valuation of Fixed Assets, $ million													
Book Value	416	432	364	385	477[3]	733	761	1,076	1,120	1,123	1,059	1,091	1,088
Cumulative Pre-vesting Revaluations				1	136								
Cumulative Post-vesting Asset Revaluations[4]						235	254	533	508	500	419	425	418
Reconstructed “Historic cost” Book value						499	507	543	612	623	641	667	671

[1] This table presents consolidated results for the lines network operations of Valley Power, Waitemata Electricity, Power New Zealand, Capital Power, Energy Direct, TransAlta NZ Ltd, Taupo Electricity, Rotorua Electricity, Tauranga District Council Electricity Division, Tauranga Electricity Ltd, and Trustpower Ltd.

[2] Revenue disclosure by UnitedNetworks Ltd for 1998 and 1999 appears to have been incomplete, probably due to omission of some categories of data for one of the three previously-reporting entities (TransAlta, TrustPower and Power New Zealand) which were amalgamated to form UNL during 1998–1999. Footnoted figures have been increased from disclosed values by use of simple interpolation to span gaps in the data where these were apparent.

[3] Vesting values of the former entities.

[4] Revaluation reserves minus $136 milion of pre-vesting revaluations.

Table 2. Revenue, Expenses and Operating Surplus for Vector Ltd and its Predecessor[1], 1991–2002

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
$ million												
Revenue excl Transpower Charges	102.4	119.7	123.9	126.4	129.2	139.4	145.9	169.1	180.1	154.3	168. 6	189.4
Operating Costs	71.7	69.9	67.5	68.7	42.9	48.0	51.2	163.0	80.9	68.6	43.2	61.1
Depreciation	17.1	17.0	15.8	25.1	15.2	16.2	16.5	18.1	20.0	26.0	25.0	30.1
Total Operating Expenses excl Transpower Charges	88.8	86.9	83.3	93.8	58.1	64.2	67.7	70.3	100.9	94.6	68.2	91.2
Pre-tax Operating Surplus	13.6	32.8	40.6	32.6	71.1	75.1	78.2	−12.0	79.2	59.7	100.4	98.2
Tax Expense	6.9	9.8	13.0	12.7	13.1	13.7	16.9	−22.3	10.2	18.8	42.3	40.0
Post-tax Operating Surplus	6.8	22.9	27.6	19.9	57.9	61.5	61.3	10.3	69.0	40.9	58.1	58.2
Electricity Conveyed, GWh	3,722	3,785	3,717	3,894	4,053	4,454	4,367	4,432	4,364	4,424	4,765	4,885
Average figures, cents per kWh conveyed												
Average Revenue c/kWh	2.8	3.2	3.3	3.2	3.2	3.1	3.3	3.8	4.1	3.5	3.5	3.9
Operating Costs	1.9	1.8	1.8	1.8	1.1	1.1	1.2	3.7	1.9	1.6	0.9	1.2
Depreciation	0.5	0.5	0.4	0.6	0.4	0.4	0.4	0.4	0.5	0.6	0.5	0.6
Total Operating Expenses excl Transpower Charges	2.4	2.3	2.2	2.4	1.4	1.4	1.6	1.6	2.3	2.1	1.4	1.9
Average Pre-tax Operating Surplus c/kWh	0.4	0.9	1.1	0.8	1.8	1.7	1.8	−0.3	1.8	1.3	2.1	2.0
Average Tax Expense	0.2	0.3	0.4	0.3	0.3	0.3	0.4	−0.5	0.2	0.4	0.9	0.8
Average Post-tax Operating Surplus	0.2	0.6	0.7	0.5	1.4	1.4	1.4	0.2	1.6	0.9	1.2	1.2
Valuation of Fixed Assets, $ million												
Book value	298	305	305	320	743	766	780	757	783	889	928	927
Cumulative post-vesting asset revaluations				0	468	481	483	420	418	418	406	406
Reconstructed “Historic cost” Book value					275	285	298	337	366	471	522	521

[1] Formerly Auckland Electric Power Board, then Mercury Energy, then Vector. Vesting date 1 October 1993.

Table 3. Revenue, Expenses and Operating Surplus for Powerco Ltd and its Predecessor Companies[1]

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
$ million												
Revenues of the Network Business excl Transpower	61.7	70.4	70.6	73.5	75.4	71.2	77.8	90.5	97.5	92.0	95.0	101.0
Operating Costs	45.2	49.6	55.3	45.8	48.6	45.1	37.2	29.0	31.7	26.4	29.2	27.5
Takeover Defence Expenditure[2]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.4	0.0
Depreciation	8.4	9.7	9.4	10.6	8.0	9.6	13.0	15.5	18.5	19.4	16.7	18.2
Total Operating Expenses excl Transpower Charges	53.6	59.3	64.8	56.4	56.7	54.7	50.1	44.5	50.2	45.8	45.9	45.7
Pre-tax Operating Surplus	8.1	11.1	5.8	17.1	18.7	16.6	27.6	46.0	47.3	46.2	49.0	55.3
Tax Expense	3.5	5.6	4.8	7.0	6.6	6.5	10.0	11.4	14.7	12.9	9.9	14.4
Post-tax Operating Surplus	5	5	1	10	12.1	10.1	17.7	34.6	32.6	33.2	39.1	41.0
Electricity Conveyed, GWh	2,033	2,092	1,990	1,918	1,917	2,004	1,954	1,909	2,037	1,985	1,941	1,955
Cents per kWh conveyed												
Average Revenue c/kWh	3.0	3.4	3.5	3.8	3.9	3.6	4.0	4.7	4.8	4.6	4.9	5.2
Operating Costs	2.2	2.4	2.8	2.4	2.5	2.2	1.9	1.5	1.6	1.3	1.5	1.4
Takeover Defence Expenditure[2]											7.3	
Depreciation	0.4	0.5	0.5	0.6	0.4	0.5	0.7	0.8	0.9	1.0	0.9	0.9
Total Operating Expenses excl Transpower Charges	2.6	2.8	3.3	2.9	3.0	2.7	2.6	2.3	2.5	2.3	2.4	2.3
Average Pre-tax Operating Surplus c/kWh	0.4	0.5	0.3	0.9	1.0	0.8	1.4	2.4	2.3	2.3	2.5	2.8
Average Tax Expense	0.2	0.3	0.2	0.4	0.3	0.3	0.5	0.6	0.7	0.7	0.5	0.7
Average Post-tax Operating Surplus	0.2	0.3	0.1	0.5	0.6	0.5	0.9	1.8	1.6	1.7	2.0	2.1
Valuation of Fixed Assets, $ million												
Book Value	171	179	175	188	194	251	377	428	405	418	412	391
Cumulative Post-vesting Asset Revaluations				8	11	65	179	226	202	215	219	208
Reconstructed “Historic cost” Book Value				180	183	186	198	202	203	202	194	183

[1] Consolidated results for Powerco, Taranaki Electricity, New Plymouth Electricity, Egmont Electricity, Central Power, Electro Power, Powerco, and Wairarapa Electricity.
[2] Not included in total operating expenses; treated as a claim on operating surplus.

Table 4. Revenue, Expenses and Operating Surplus for Orion Ltd and its Predecessor Companies[1]

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
$ million												
Revenues of the Network Business excl Transpower	49.9	58.1	59.9	61.5	68.4	75.3	80.5	86.6	94.3	97.8	103.5	102.0
Operating Costs	32.2	37.0	39.5	35.3	37.1	38.8	39.5	37.5	20.0	23.7	31.5	32.1
Depreciation	8.2	11.5	10.1	12.9	9.3	10.2	11.0	16.4	16.8	17.1	16.1	17.2
Total Operating Expenses excl Transpower Charges	40.3	48.6	49.6	48.2	46.4	48.9	50.5	53.9	36.7	40.9	47.6	49.3
Pre-tax Operating Surplus	9.5	9.6	10.3	13.3	22.0	26.3	30.0	32.7	57.6	56.9	55.9	52.7
Tax Expense	5.0	4.5	5.1	5.3	9.5	8.0	8.4	13.7	19.0	21.2	22.9	21.7
Post-tax Operating Surplus	4.6	5.1	5.2	8.1	12.5	18.3	21.6	19.0	38.6	35.7	33.0	31.0
Electricity Conveyed, GWh	2,140	2,294	2,271	2,273	2,416	2,507	2,530	2,582	2,560	2,601	2,683	2,759
Cents per kWh conveyed												
Average Revenue c/kWh	2.3	2.5	2.6	2.7	2.8	3.0	3.2	3.4	3.7	3.8	3.9	3.7
Operating Costs	1.5	1.6	1.7	1.6	1.5	1.5	1.6	1.5	0.8	0.9	1.2	1.2
Depreciation	0.4	0.5	0.4	0.6	0.4	0.4	0.4	0.6	0.7	0.7	0.6	0.6
Total Operating Expenses excl Transpower Charges	1.9	2.1	2.2	2.1	1.9	2.0	2.0	2.1	1.4	1.6	1.8	1.8
Average Pre-tax Operating Surplus c/kWh	0.4	0.4	0.5	0.6	0.9	1.1	1.2	1.3	2.3	2.2	2.1	1.9
Average Tax Expense	0.2	0.2	0.2	0.2	0.4	0.3	0.3	0.5	0.7	0.8	0.9	0.8
Average Post-tax Operating Surplus	0.2	0.2	0.2	0.4	0.5	0.7	0.9	0.7	1.5	1.4	1.2	1.1
	2.3	2.5	2.6	2.7	2.8	3.0	3.2	3.4	3.7	3.8	3.9	3.7
Valuation of fixed assets, $ million												
Book Value	120	172	191	317	302	314	490	485	467	430	442	462
Cumulative Pre-vesting Asset Revaluations	0	52	71									
Cumulative Post-vesting Asset Revaluations				117	117	117	293	293	274	232	202	202
Reconstructed “Historic cost” Book value				200	184	196	198	193	194	198	240	260

[1] Formerly Southpower Ltd; before that, Christchurch MED, plus Kaiapoi, Port Hills, and Mid Canterbury Electric Power Boards. Vesting date 30 April 1993.

Table 5. Revenue, Expenses and Operating Surplus for All Other Companies

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
$ million												
Revenues of the Network Business excl Transpower	242.3	254.1	267.1	240.4	240.2	267.8	299.1	295.3	287.6	322.0	350.0	357.8
Operating Costs	173.0	170.1	177.8	184.6	158.0	154.1	174.2	165.7	138.5	145.3	156.4	159.3
Depreciation	37.6	39.6	42.5	43.2	35.6	36.6	41.1	46.9	43.1	58.1	61.3	70.7
Total Operating Expenses excl Transpower Charges	210.6	209.7	220.3	227.7	193.6	190.7	215.3	212.6	181.7	203.4	217.6	230.0
Pre-tax Operating Surplus	31.7	44.4	46.7	12.7	46.5	77.0	83.7	82.7	106.0	118.6	132.4	127.8
Tax Expense	10.0	15.2	25.4	15.1	14.9	15.4	18.0	13.8	20.2	21.2	30.4	27.7
Post-tax Operating Surplus	21.7	29.3	21.3	−2.4	31.6	61.6	65.7	68.9	85.8	97.4	102.0	100.0
Electricity Conveyed, GWh	9,085	9,283	9,056	8,900	8,909	9,149	9,306	9,565	9,128	9,723	10,253	10,436
Cents per kWh conveyed												
Average Revenue c/kWh	2.7	2.7	2.9	2.7	2.7	2.9	3.2	3.1	3.2	3.3	3.4	3.4
Operating Costs	1.9	1.8	2.0	2.1	1.8	1.7	1.9	1.7	1.5	1.5	1.5	1.5
Depreciation	0.4	0.4	0.5	0.5	0.4	0.4	0.4	0.5	0.5	0.6	0.6	0.7
Total Operating Expenses excl Transpower Charges	2.3	2.3	2.4	2.6	2.2	2.1	2.3	2.2	2.0	2.1	2.1	2.2
Average Pre-tax Operating Surplus c/kWh	0.3	0.5	0.5	0.1	0.5	0.8	0.9	0.9	1.2	1.2	1.3	1.2
Average Tax Expense	0.1	0.2	0.3	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.3	0.3
Average Post-tax Operating Surplus	0.2	0.3	0.2	0.0	0.4	0.7	0.7	0.7	0.9	1.0	1.0	1.0
Valuation of fixed assets, $ million												
Book Value	718	761	748	832	724	917	1,059	1,140	1,270	1,250	1,526	1,496
Cumulative Post-vesting Asset Revaluations				5	144	316	422	585	581	640	724	612
Reconstructed “Historic cost” Book Value				828	581	600	636	554	690	611	803	884

Table 6. Revenue, Costs, and Operating Surplus for the Lines Industry as a Whole

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
$ million												
Revenues of the Network Business excl Transpower	609.1	665.6	707.3	682.0	689.6	745.5	836.8	902.2	931.8	950.0	1,007.0	1,060.8
Operating Costs	416.1	432.5	453.9	437.5	362.9	366.1	397.8	481.4	347.9	327.2	323.9	340.9
Depreciation	90.9	98.6	99.5	117.6	94.8	108.3	121.0	141	141	163.1	162.0	181.3
Total Operating Expenses excl Transpower Charges	507.0	531.1	553.5	555.1	457.7	474.4	518.8	511.1	489.3	490.4	486.0	522.2
Pre-tax Operating Surplus	102.0	134.4	153.8	126.9	231.9	271.1	318.0	280.2	442.5	459.7	521.0	538.5
Tax Expense	36.5	46.1	68.2	64.6	69.5	70.8	81.9	41.8	93.1	100.5	132.3	143.8
Post-tax Operating Surplus	65.5	88.4	85.6	62.3	162.4	200.3	236.1	238.4	349.4	359.2	388.8	394.8
Electricity Conveyed, GWh	22,625	23,634	22,598	22,857	23,071	24,595	24,883	25,219	24,407	25,286	26,383	27,318
Cents/kWh												
Average Revenue c/kWh	2.7	2.8	3.1	3.0	3.0	3.0	3.4	3.6	3.8	3.8	3.8	3.9
Operating Costs	1.8	1.8	2.0	1.9	1.6	1.5	1.6	1.9	1.4	1.3	1.2	1.2
Depreciation	0.4	0.4	0.4	0.5	0.4	0.4	0.5	0.6	0.6	0.6	0.6	0.7
Total Operating Expenses excl Transpower Charges	2.2	2.2	2.4	2.4	2.0	1.9	2.1	2.0	2.0	1.9	1.8	1.9
Average Pre-tax Operating Surplus c/kWh	0.5	0.6	0.7	0.6	1.0	1.1	1.3	1.1	1.8	1.8	2.0	2.0
Average Tax Expense	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.2	0.4	0.4	0.5	0.5
Average Post-tax Operating Surplus	0.3	0.4	0.4	0.3	0.7	0.8	0.9	0.9	1.4	1.4	1.5	1.4
Valuation of fixed assets, $ million												
Book Value	1,739	1,780	1,804	2,134	2,697	3,008	3,783	3,929	4,049	4,046	4,399	4,364
Cumulative Post-vesting Asset Revaluations				130	975	1,234	1,910	2,032	1,974	1,924	1,975	1,845
Reconstructed “Historic cost” Book Value				1,923	1,721	1,774	1,873	1,897	2,075	2,123	2,425	2,519

The volume series used as denominators to calculate average revenue and costs are in some cases gross and in some cases net of line losses, depending on the reporting practice of each company. This results in minor discrepancies across companies in the denominators of these ratios, but not in the trend of the price-cost markup over time, given that a consistent volume measure has been used for each company. Where possible the series used is electricity delivered off each network, net of line losses. The results reported below are not sensitive to disclosure discrepancies in this area.

4.2. Results

Tables 1–7 and Figure 1 show that price-cost margins in the industry widened significantly during the decade following deregulation. Operating costs per kWh fell sharply, especially in the cases of Powerco and UnitedNetworks which reaped large economies of scale as their amalgamation of multiple network companies reduced administrative overheads and maintenance costs. Measured in nominal terms (Table 6), average variable cost for the industry as a whole fell from 1.6 cents/kWh in 1995 to 1.2 cents/kWh by 2002, while average revenue rose from 3.0 to 3.9 cents/kWh. In real terms (Table 7), average cost fell from 1.85 cents/kWh to 1.25 cents/kWh while average revenue rose from 3.49 to 3.88 cents/kWh over the same period.

Figure 2 compares operating-cost reductions across the four leaders and the rest. It is notable that the two large companies which did not engage in merger and takeover activity (Orion and Vector) exhibit virtually the same trend reduction in operating cost as the trust-owned remainder of the industry, cutting average costs by a little over half a cent per kWh 1994–2002, whereas the two which grew by mergers (Powerco and United) achieved cost efficiencies roughly double this (over one cent per kWh), leaving Powerco at about the industry average and United about one cent per kWh below it.

Across the entire industry, prices were increased as operating costs fell, and the price-cost margin rose accordingly. Figure 3 shows the trend of the Lerner Index $\frac{p-c}{p}$ for the four majors and the remainder. For the industry as a whole the index roughly doubled, from about 0.35 in the early 1990s and 0.47 in 1995, to 0.68 by 2002. Powerco, Orion and Vector tracked with the overall average; UnitedNetworks outstripped the rest, with a rise in its Lerner Index from 0.4 to 0.8 in only eight years. The smaller companies in the rest of the industry had a lower increase, from about 0.3 to about 0.55.

The conclusion to emerge from this analysis is that there was no pass-through of cost savings to consumers;[9] on the contrary, the lines-charge component of electricity bills increased as operating costs of lines companies fell. Only Vector—hit by massive cost increases due to the 1998 collapse of its central-city system—provides an exception to prove the rule.

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9 It should be borne in mind, however, that where lines networks have remained controlled by consumer trusts, the increased profit margins come back again (net of company tax) to consumers via rebates and discounts.

Table 7. Cost-price Margins in Real Terms at March 2002 Prices: Cents per kWh

	PPI Inputs	UNL				Powerco			
	deflator at March	Revenue	Cost	Margin	Lerner index	Revenue	Cost	Margin	Lerner index
1991	944	3.40	2.09	1.31	0.38	3.81	2.79	1.02	0.27
1992	951	3.29	2.14	1.16	0.35	4.19	2.96	1.24	0.29
1993	974	4.06	2.49	1.57	0.39	4.32	3.39	0.93	0.22
1994	996	3.65	2.09	1.56	0.43	4.56	2.84	1.72	0.38
1995	1008	3.48	1.56	1.92	0.55	4.62	2.98	1.64	0.35
1996	1015	3.46	1.44	2.01	0.58	4.15	2.63	1.53	0.37
1997	1018	4.04	1.66	2.39	0.59	4.63	2.22	2.42	0.52
1998	1024	4.53	0.85	3.68	0.81	5.49	1.76	3.73	0.68
1999	1029	4.99	0.95	4.04	0.81	5.51	1.79	3.72	0.68
2000	1052	4.88	1.09	3.80	0.78	5.22	1.50	3.72	0.71
2001	1153	4.42	0.97	3.45	0.78	5.03	1.55	3.48	0.69
2002	1185	4.27	0.84	3.43	0.80	5.17	1.40	3.76	0.73
		Vector				Orion			
		Revenue	Cost	Margin	Lerner index	Revenue	Cost	Margin	Lerner index
1991		3.45	2.42	1.03	0.30	2.93	1.89	1.04	0.36
1992		3.94	2.30	1.64	0.42	3.16	2.01	1.15	0.36
1993		4.06	2.21	1.85	0.46	3.21	2.12	1.10	0.34
1994		3.87	2.10	1.77	0.46	3.22	1.85	1.37	0.43
1995		3.75	1.25	2.51	0.67	3.33	1.81	1.52	0.46
1996		3.66	1.26	2.40	0.66	3.51	1.81	1.70	0.48
1997		3.89	1.37	2.53	0.65	3.70	1.82	1.89	0.51
1998		4.42	4.26	0.16	0.04	3.88	1.68	2.20	0.57
1999		4.75	2.14	2.62	0.55	4.24	0.90	3.35	0.79
2000		3.93	1.75	2.18	0.56	4.24	1.03	3.21	0.76
2001		3.64	0.93	2.71	0.74	3.97	1.21	2.76	0.70
2002		3.88	1.25	2.63	0.68	3.70	1.16	2.53	0.69
		Other companies				Whole industry			
		Revenue	Cost	Margin	Lerner index	Revenue	Cost	Margin	Lerner index
1991		3.35	2.39	0.96	0.29	3.38	2.31	1.07	0.32
1992		3.41	2.28	1.13	0.33	3.51	2.28	1.23	0.35
1993		3.59	2.39	1.20	0.33	3.81	2.45	1.36	0.36
1994		3.22	2.47	0.75	0.23	3.55	2.28	1.27	0.36
1995		3.17	2.09	1.09	0.34	3.49	1.85	1.63	0.47
1996		3.42	1.97	1.45	0.42	3.54	1.74	1.80	0.51
1997		3.74	2.18	1.56	0.42	3.91	1.86	2.05	0.52
1998		3.57	2.01	1.57	0.44	4.15	2.04	2.11	0.51
1999		3.63	1.75	1.88	0.52	4.40	1.52	2.88	0.65
2000		3.73	1.68	2.05	0.55	4.23	1.46	2.78	0.66
2001		3.51	1.57	1.94	0.55	3.92	1.26	2.66	0.68
2002		3.43	1.53	1.90	0.55	3.88	1.25	2.64	0.68

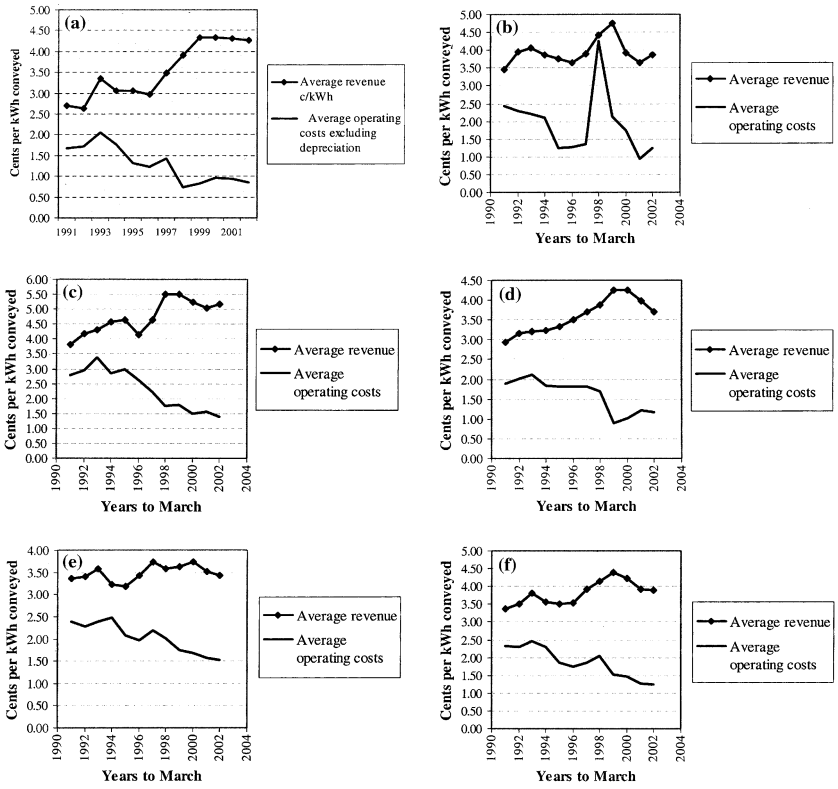

Figure 1. Price-cost margins in real terms (Deflated to March 2002 values): (a) UnitedNetworks Ltd; (b) Vector Ltd; (c) Powerco Ltd; (d) Orion Ltd; (e) All 27 Other Lines Companies Aggregated; (f) Whole Industry.

5. Asset Revaluations and Excess Profits

In terms of equations (1) and (2), the post-corporatization increase in price-cost margin F can be decomposed into changes in k (the weighted average cost of capital), A (the value of fixed assets), and/or Π (monopoly rent). Rewriting equation (2) to show the decomposition in more detail,

$$F \equiv k \cdot A + \Pi + (D - \mathrm{REV}) = k \cdot K.p_K + \Pi + (D - \mathrm{REV}), \tag{3}$$

where K is the physical volume of asset inventory and p_K is the average value of the assets in this inventory.

The cost of capital k fell over the decade (see Table 8, derived later in this article). Therefore the increased margins found in section 3 are attributable to some combination of an increase in the physical capital stock K, revaluation of existing capital assets (a change in p_K), and increased monopoly rents Π.

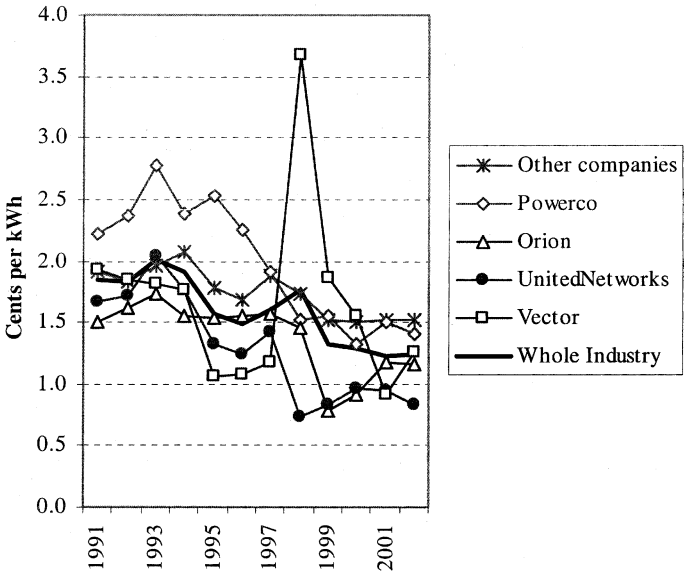

Figure 2. Average operating cost by company.

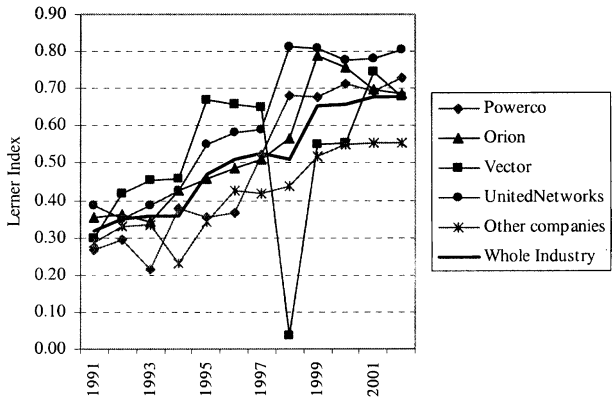

Figure 3. Lerner index Trends, 1991–2002.

The book values of fixed assets as reported by the lines businesses are shown in the bottom panels of Tables 1–6. The total disclosed and audited book value of the industry rose from $1.8 billion in March 1993, prior to corporatization, to $4.4 billion by 2001. Using book value as the denominator for evaluating the overall rate of profit, the pre-tax net operating surplus (EBIT) was in the range 6–8% prior to corporatization, and rose to 12–13% in 2000–2002.[10] The steep increase in

10 In recent work for the New Zealand Commerce Commission, Lally (2003, p. 4) has estimated the weighted average cost of capital for the industry as 6.8% with a range from 5.8 to 8.0%.

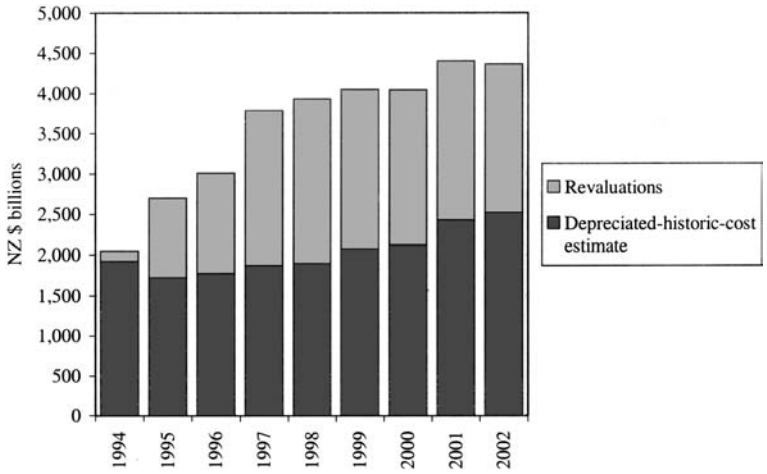

Figure 4. Book value of fixed assets of electricity lines companies.

fixed assets seems to have legitimized the industry's increased margins in the eyes of the authorities responsible for regulatory oversight of the industry.

Figure 4 compares the time-path of the book value of fixed assets with an estimate of the ratebase that would have been allowed under US regulatory procedures since the *Hope* decision in 1945. Regulators in both the US and the UK work from a starting valuation for each enterprise resting either on the original cost of each asset at its date of installation or (in the case of the UK privatizations) on the "vesting value" at which assets were transferred at the time of industry restructuring (Grout, 1995; Newbery, 1997). This starting value is then updated annually by subtracting depreciation and adding new investment, to provide an asset valuation which can loosely be characterized as historic-cost[11]. Valuations constructed along these lines appear as the bottom rows in Tables 1–6, and in Figure 4.[12]

Of the $3.6 billion increase in the industry's reported ratebase 1993–2002 only $0.7 billion was attributable to net new investment. The remaining $2.9 billion of

11 Loosely, because vesting values assigned to newly-privatized assets are not to be confused with pinpoint-accurate historic-cost values at that date. UK regulators usually adjust historic-cost asset values for inflation and work with a real rate of return.

12 The figures were obtained by taking companies' cash expenditures on acquisition of new fixed assets (excluding prices paid in inter-company transfers of existing assets), subtracting annual depreciation allowances as recorded in the annual accounts, and using the resulting net capital expenditure series to update the book values at corporatization. In the later years of the period covered, depreciation allowances were calculated by the companies on their revalued, rather than original-cost, fixed assets. Rather than attempting to correct for this, it was decided to stick with the disclosed figures, since the resulting downward bias to the historic-cost estimates of capital stock had not by 2002 cumulated sufficiently to make a significant difference to the picture. (The cumulative downward bias to the 2002 historic-cost series from this source was estimated not to exceed $0.15 billion, or 6% of the total, up from zero in 1999.)

additions to the ratebase were unilaterally declared revaluations, underwritten by increasing price-cost margins imposed on the industry's captive customers.

In hearings before the New Zealand Commerce Commission during 2002,[13] lines company representatives argued vigorously that these revaluations should be retrospectively allowed as a legitimate ratebase increase. Two main reasons were given: first that inventories had been unexpectedly increased by the discovery of fixed assets which had been overlooked when vesting book values were established in 1994; and second, that revaluation of assets to "optimized deprival value" (a variant of replacement cost) had been required of the companies by Government.[14]

The Commerce Commission accepted these arguments, and in December 2002 issued a decision which allowed the companies' disclosed 2002 ODV book values, including all revaluations to date, to be reclassified as "historic cost" ratebases. (Commerce Commission 2002b, paragraph 98–110, pp. 23–25, 2003, paragraph 155–163, pp. 35–36). This decision enables a sharp distinction to be drawn between the US regulatory regime, which in general does not allow ratebase revaluation, and the "light-handed" approach in New Zealand which has restored legitimacy to valuation practices which were common in the USA between *Smyth v Ames* (1898) and *Federal Power Commission v Hope Natural Gas Company*, 320 U.S. 591 (1944).

This is only the second full-scale rate-making decision by the Commission under Part IV of the Commerce Act 1986. To highlight its implications, the final section of this paper estimates the magnitude of the excess profits that a conventional rate-of-return regulator would have identified in the New Zealand electricity networks industry since corporatization in 1994. The results from this exercise amount to a quantitative estimate of the consequences for electricity network prices and revenues of New Zealand's switch from a "heavy-handed" to a "light-handed" regulatory stance.

6. Estimating Excess Earnings

Lally (2002, 2003, section 3.2) has set out two alternative methodologies for measuring excess earnings. One of these uses an accrual procedure with asset revaluations included as revenue in the year when they accrue to the books. Excess earnings then consist of the excess of actual revenues, including asset revaluations, over warranted revenues calculated to recover operating costs, depreciation (with revaluations included as negative depreciation) and tax expense, plus a WACC-based return on book value at the beginning of each period. Excess

13 The issues were set out in Commerce Commission (2002a). The record of submissions, hearings, and Commission documents is on the web at http://www.comcom.govt.nz/electricity.

14 An optimised deprival valuation of assets was required to be prepared and published as part of regulated financial information disclosure under the Electricity (Information Disclosure) Regulations 1994 and 1999. The issue here is whether that disclosure exercise amounted to an instruction to change the ratebase on which prices were set, or was purely a benchmarking procedure.

revenues thus calculated are compounded forward, using the WACC for each year, to the terminal date, and labeled "compounded excess earnings". This figure represents the sum which would have to be rebated in the terminal year to compensate customers fully for all over-charging during the period analyzed, on the assumption that the asset valuation at the starting date is accepted as a legitimate initial ratebase.

The criterion used in this model to distinguish fair returns from excess profit is that the original investor should obtain a commercial return on and of capital committed, but no more than this unless clear reasons exist for allowing a higher return. This basic principle should hold unchanged when assets are transferred to new owners: the appropriate transfer price, in the absence of expectations of excess profits, ought to be equal to the ratebase (book value of assets) used to set warranted revenues and hence prices for each period.

Lally's model assumes that the regulator allows asset revaluations to take place (at least up to replacement-cost) and treats these revaluations as accruals of windfall revenue in the year when they occur. A standard rate-of-return profit ceiling then yields the warranted revenue to be recovered from customers in each period. This will imply very low, possibly negative, warranted price of service in years when large upward asset revaluations are taken onto the books.

Excess profit is defined by Lally (2002, p. 510) as

$$\text{Excessprofit}_t = R_t - R_t^{\mathsf{W}} = R_t - C_t - D_t - T_{\mathsf{C}}(R_t - C_t - \hat{D}_t) + \text{REV}_t - kA_{t-1} \quad (4)$$

where R_t is the actual operating revenue in year t, R_t^{W} the warranted revenue, sufficient to recover all costs including a fair return on and of capital, A_{t-1} the book value of assets at the beginning of period t, which serves as the ratebase for determination of the warranted return on capital, k the appropriate weighted cost of capital (warranted rate of return on net book value), REV_t the revaluations taken onto the books in year t, T_{C} the company tax rate, C_t the operating cost in year t, D_t the depreciation in year t for purposes of revenue setting, $\hat{D}_t$ the depreciation allowable for tax purposes, which may or may not equal D_t.

In principle this matches the conception of excess profit which was embodied in the 1994 Electricity (Information Disclosure) Regulations, which required firms to disclose their Accounting Rate of Profit including asset revaluations as accrued income for the specific purpose of "monitoring monopoly behavior" (Ernst and Young 1994, p. 3). This analytical framework, in other words, was familiar to industry participants prior to the revaluation stampede of 1995–1999.

The second Lally procedure is a cash flow approach which constructs an income stream by calculating, for each year, the gross operating surplus after tax, and subtracting actual capital expenditure on fixed assets undertaken during the year (exclusive of purchases of goodwill and other intangibles created when other companies are added to the operation by takeover or merger). The stream is then augmented by subtracting initial book value in period $t = 0$ and adding the terminal book value to income in the final period, thus setting the analysis up as an investment project for which a present value can be calculated. If the present

value of the project is positive when the WACC is used as the discount rate, then the analyst adds a time-invariant premium to the WACC sufficient to reduce the present value to zero (breakeven). The size of this premium measures the excess of realized return over the weighted average cost of capital.

A number of recent New Zealand studies which have used an IRR approach to estimate excess profits of electricity lines, gas pipelines, airports and port companies (Bertram and Terry, 2000; Bertram et al., 2000, 2001, 2002; Bertram, 2002) have run into the problem that the IRR is a single figure for the entire period, whereas the WACC with which it is compared is time-varying due to changes in the risk-free rate, including changes due to the rate of inflation. Lally's approach finesses this problem.

The standard IRR is the value of r that solves the equation:

$$B_0 = \sum_{t=1}^{n-1} \frac{\mathsf{CF}_t - \mathrm{CAP}_t}{(1+r)^t} + \frac{\mathsf{CF}_n + B_n - \mathrm{CAP}_n}{(1+r)^n}, \tag{5}$$

where CF_t is the operating cashflow in year t, CAP_t the capital expenditure in year t, B_0 the opening asset value (the initial investor's stake), B_n the book value of the assets at termination date of the analysis.

If WACC is constant over the period, then excess profit is $(r-k)$. This was the approach taken by Bertram et al. in the studies cited earlier. As Lally notes, however, "if the WACC is not constant over time, then one must express the IRR as the sum of the WACC for a year and a premium p that is treated as constant over all years. If the ex-post NPV is positive (negative) then the premium p will be positive (negative)" (Lally, 2003, p. 49). For a firm with a life of n years, an initial investment of B_0, and a terminal asset value B_n, the premium p solves the equation

$$B_0 = \frac{\mathrm{CF}_1 - \mathrm{CAP}_1}{1+k_1+p} + \cdots + \frac{\mathrm{CF}_n + B_n - \mathrm{CAP}_n}{(1+k_1+p)(1+k_2+p)\cdots(1+k_n+p)} \tag{6}$$

with notation as before except that here k_t is the WACC in year t.

Table 8 presents an annual WACC series calculated using the parameters suggested by Lally (2003), namely the interest rate on five-year New Zealand Government bonds, adjusted for 30% gearing, a 33% tax rate, debt premium 1%, asset beta of 0.4, and equity risk premium 0.07.

The results from application of Lally's two excess-earnings models to the disclosed data for electricity lines companies are set out in Table 9. In calculating warranted revenue using equation (4), actual recorded depreciation has been used for both D and $\hat{D}$, since no distinction was made between the two by the companies. In constructing CF_n when applying equation (6), actual tax has been adjusted for the interest tax shield by adding 0.33 times reported interest expense.

Two observations serve to characterize the results. Firstly, excess profits in the accruals-based analyses appear as one-off "spikes" in the years when revaluations are credited to the company books as capital gains. This clustering of excess earnings is a function not of any sharp fluctuation in the prices faced, or sums

Table 8. Weighted Average Cost of Capital (WACC) Nominal, Pre-Tax

Year ended March	WACC
1991	11.20%
1992	9.04%
1993	8.05%
1994	7.16%
1995	8.62%
1996	8.25%
1997	8.39%
1998	7.77%
1999	6.99%
2000	7.50%
2001	7.29%
2002	7.27%

Source: See text

of money paid out, by consumers. Rather it is due to the accrual approach to accounting, which credits to the year of revaluation the entire discounted value of the subsequent additional revenues (including monopoly rents) expected to be extracted from customers.

Hence in analyzing disclosure data using the accrual approach, the analyst should expect to encounter sharp one-off spikes in recorded rates of return, and should ensure that these spikes are included, together with other years exhibiting lower returns, when calculating excess profits over a period. Failure to recognize this probably accounts for the New Zealand Government's tolerance of industry price and profit performance up to 2002. A Ministerial Inquiry in 2000, for example, took the view that high profit spikes were non-typical one-off events which, far from being included in the overall analysis, should be treated as outliers and therefore ignored when calculating long-run rates of return (see Caygill et al. 2001, paragraphs 72–79).

Secondly, the sums involved are very large, when measured in dollar terms. Electricity networks' compounded excess earnings over the 8 years 1995–2002 totaled $2.6 billion in a period when New Zealand's annual GDP was of the order of $100 billion.

The time pattern of excess earnings in Table 9 varies across companies. Orion (previously Southpower Ltd) undertook pre-emptive revaluations in 1992 and 1994, ahead of the official asset vesting process and the disclosure regulations. Thus when the excess-earnings exercise is extended back into pre-corporatization history (the 1992–1994 rows in Table 9) Orion stands out as the first company to exhibit very large positive excess earnings (in 1992 and 1994).

Similar pre-emptive revaluations ahead of corporatization were undertaken in 1993 and 1994 by Valley Power and Waitemata Power, the two core companies

Table 9. Application of Lally's Two Approaches to Measuring Excess Returns 1995–2002, $ million

Year	UNL			Vector			Powerco		
ended March	Warranted revenue	Actual revenue	Excess earnings	Warranted revenue	Actual revenue	Excess earnings	Warranted revenue	Actual revenue	Excess earnings
1992	181.0	163.2	−17.8	124.7	119.7	−5.0	78.4	70.4	−8.1
1993	122.1	185.8	63.7	121.3	123.9	2.7	81.1	70.6	−10.5
1994	103.7	180.1	76.4	126.4	126.4	0.0	66.3	73.5	7.3
1995	−66.4	176.5	243.0	−359.2	129.2	488.4	76.2	75.4	−0.9
1996	200.3	191.8	−8.4	137.9	139.4	1.4	22.2	71.2	49.1
1997	−116.5	233.5	349.9	155.9	145.9	−10.0	−33.9	77.8	111.7
1998	242.3[2]	263.4	21.1	312.3	169.1	−143.2	42.4	90.5	48.1
1999	330.5[2]	273.7	−56.8	182.3	180.1	−2.2	119.7	97.5	−22.2
2000	309.5	284.0	−25.6	173.0	154.3	−18.7	78.1	92.0	13.9
2001	250.6	289.9	39.3	177.9	168.6	−9.2	89.5	95.0	5.5
2002	255.6	310.6	55.1	193.0	189.4	−3.6	104.8	101.0	−3.8
Compounded excess earnings[1]			918.3			578.1			288.2
Excess over WACC			12.4%			14.9%			10.1%

Year	Orion			Other companies			Total		
ended March	Warranted revenue	Actual revenue	Excess earnings	Warranted revenue	Actual revenue	Excess earnings	Warranted revenue	Actual revenue	Excess earnings
1992	10.2	58.1	48.0	289.3	254.1	−35.1	683	666	−18
1993	50.8	59.9	9.2	297.0	267.1	−29.9	672	707	35
1994	−50.9	61.5	112.5	280.8	240.4	−40.4	526	682	156
1995	81.0	68.4	−12.6	141.8	240.2	98.4	−127	690	816
1996	82.5	75.3	−7.2	103.1	267.8	164.7	546	746	200
1997	−90.0	80.5	170.5	213.9	299.1	85.1	129	837	707
1998	102.8	86.6	−16.2	159.0	295.3	136.3	859	905	46
1999	108.7	94.3	−14.4	301.1	287.6	−13.5	1,042	933	−109
2000	136.3	97.8	−38.5	278.8	322.0	43.2	976	950	−26
2001	97.4	103.5	6.1	268.5	350.0	81.5	884	1,007	123
2002	98.8	102.0	3.1	495.0	357.8	−137.2	1,147	1,061	−86
Compounded excess earnings[1]			137.1			704.5			2,626.1
Excess over WACC			1.2%			4.8%			8.5%

[1] Using the WACC for each year.
[2] Using interpolated values for some items of 1998 and 1999 costs of UNL where gaps or understatements of certain items in the disclosed data were encountered; the effect of all adjustments is to increase warranted revenue.
Note: the horizontal line between 1994 and 1995 marks the switch from the old to the new system of financial disclosure.

Table 10. Alternative Warranted-Revenue Paths and Excess Earnings Estimates, $ million

	Warranted revenue under light-handed regulation with revaluations allowed (from Table 9)	Warranted revenue under conventional rate-of-return regulation	Actual total revenue of lines businesses (from Table 6)	Excess earnings with revaluations allowed	Excess earnings with revaluations prohibited
1992	683	733	666	−18	−67
1993	672	743	707	35	−36
1994	526	721	682	156	−39
1995	−127	700	690	816	−10
1996	546	706	746	200	40
1997	129	773	837	707	64
1998	859	872	902	43	30
1999	1,042	768	932	−110	163
2000	976	798	950	−26	152
2001	884	813	1,007	123	194
2002	1,147	876	1,061	−86	184

around which the UnitedNetworks business was constructed between 1994 and 2000. These early revaluations were so-called "fair value" exercises providing only a foretaste of the full push up to ODV by those companies in 1995–1997. Vector, in contrast, engaged in a single "big bang" revaluation in 1995 (and an accompanying aggressive upward push on its price-cost margin—see Figure 1 above), from which it subsequently beat a gradual retreat after the Auckland CBD crisis of 1998.

The Powerco group of companies embarked on the revaluation process 5 or 6 years after Southpower's lead, and then pushed through the entire transition to ODV in the space of 3 years.

In order to facilitate comparison of the results in this paper with those from other regulatory inquiries both in New Zealand and elsewhere, Table 10 presents for the industry as a whole[15] a warranted revenue series constructed to show the outcome which would have occurred had New Zealand followed the US practice of prohibiting unilateral asset (ratebase) revaluation by regulated companies (see Viscusi et al. 2001, Chapter 12). This series is calculated using the historic-cost asset values from Tables 1–6 in place of the revalued asset ratebase used in Table 9.

15 Individual company series are readily calculated from data in this paper but are not shown here since the industry-wide aggregate is the figure of most interest.

In this model, a hypothetical regulator using historic-cost asset valuations sets warranted revenue to solve

$$R_t^{\mathrm{W}} = C_t + D_t + k(A_{t-2} - D_{t-1} + I_{t-1}) + T_c(R_t - C_t - \hat{D}_t),$$

where I is new investment in fixed assets.

The absence from this equation of revaluations (which appeared as negative warranted revenue in Table 9) means that the counterfactual series lacks the sharp downward spikes of warranted revenue, and corresponding upward spikes of excess earnings, seen in Table 9. Also, because the simulated ratebase grows only at the rate of net investment, warranted revenue in this model is lower and excess earnings higher in the period since completion of the actual revaluations about 1999. Compounded excess earnings as at 2002 are larger in the scenario with revaluations (because of the failure by Government during the 1990s to act to prevent the sharp profit spikes caused by revaluations) but when one looks at the level of excess earnings going forward, the historic-cost-based figure is the simplest counterfactual benchmark, showing what would have occurred had the previous rate-of-return regulatory framework been retained as the alternative to switching to light-handed regulation.

The simplicity of the historic-cost benchmark in contrast to the extreme volatility and confusion of the replacement-cost-based regulatory revenue path constitute a powerful argument against the recent New Zealand and Australian adoption of Optimized Depreciated Replacement Cost (ODRC) asset valuations for regulatory purposes. In a setting of information asymmetry between the regulator and the corporate sector, implementation of a replacement-cost regulatory model involves potentially disruptive retrospective clawing-back of excess revenue once outcomes are disclosed (always after the end of the relevant regulatory period). The ability of a historic-cost regulator to strike *ex ante* regulatory bargains, enabling all parties to operate in a climate of relative certainty, is an important advantage over the replacement-cost process of *ex post* adjustment. Indeed, the difficulty of implementing such *ex post* redistributive remedies raises serious problems of time inconsistency for regulators and governments: after the event, there is always a strong incentive to "let sleeping dogs lie", as New Zealand has done with electricity network profits.

Figure 5 shows the three revenue paths (two warranted and one actual), which sum up succinctly the empirical results of this paper. If one takes the view that asset revaluations are allowable but ought not to imply lump-sum wealth transfers from consumers, then revenues since 1999 have been at the warranted level, but are overhung by an accumulated excess earnings liability of $2.6 billion from the mid-1990s which (had it not been written-off by the Commerce Commission in 2002–2003) would have remained to be rebated to consumers.

If a conventional rate-of-return model is used which outlaws unilateral ratebase revaluations by natural monopolies, then the current and ongoing level of revenues as at 2002–2003 is nearly $200 million above the warranted level. Only by turning a blind eye to the wealth-transfer implications of the past decade's

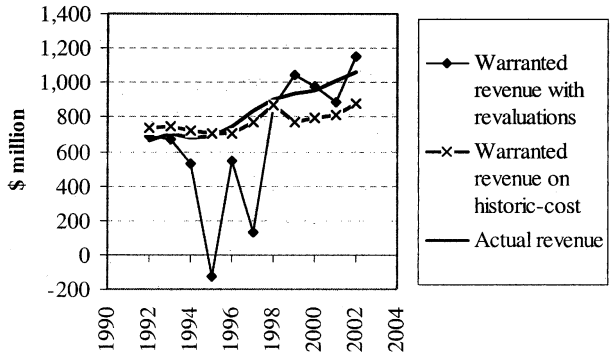

Figure 5. Three Revenue Paths Compared.

revaluations could one reach the position adopted by the New Zealand Commerce Commission, that no departure from the warranted revenue path has taken place.

The cost to electricity consumers of the New Zealand Government's regime change from conventional regulation to "light handed regulation", measured as the amount by which electricity network companies' revenues have been (and remain) higher under the new regime than they would have been under the old, can thus be measured either as a levy on consumer wealth of $200 million per year going forward, or as a $2.6 billion accrued lump-sum wealth transfer.

7. Conclusion

This paper has presented some results from a study of financial performance information disclosed by electricity lines networks in New Zealand since corporatization in 1994. The central results are as follows.

Price-cost margins in nominal terms have increased from around one cent per kWh (about a 30% markup over variable cost) in the early 1990s to nearly three cents per kWh by 2002 (a 70% markup). In real terms the increase was from 1.63 cents in 1995 to 2.64 cents in 2002. UnitedNetworks was the most successful firm on this front, having raised its margin from 55% to 80% of final price over the 7 years.

Asset revaluations were taken onto the books of lines companies both to reflect and to underwrite the increase in margins. No steps were taken by companies or Government to mitigate the resulting wealth transfers from consumers to lines businesses, although trust-owned companies have partially compensated by rebating their after-tax profits back to consumers.

Compounded excess earnings of the lines industry, measured using the methodology prepared for the Commerce Commission by Lally (2002), are estimated to have been $2.6 billion for the 9 years 1994–2002. This represents roughly an 8% premium over the weighted average cost of capital.

An alternative approach that uses as counterfactual a standard rate-of-return regulatory framework shows that allowed annual revenues since 1999 would have been nearly $200 million per year lower under a so-called "heavy-handed" regime. Given that the prevailing level of electricity network revenues has recently been accepted as legitimate by the Commerce Commission, this figure of roughly $200 million per year provides a benchmark estimate of the ongoing cost to electricity consumers of New Zealand's switch from a heavy-handed to a light-handed regulatory framework, as those terms have been interpreted by the New Zealand Government and its main regulatory agency.

New Zealand's unsuccessful experiment with information disclosure in its electricity (and natural gas) network industries demonstrates that the reduction of information asymmetries may a poor substitute for industry regulation in achieving effective regulation of network industries.

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