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Abstract

We assembled a database consisting of fifty two regulatory decisions, involving two hundred and fifty four annual observations, made by seven different regulators and across five different industries. For each of these observations we construct a variable that represents the proportion of the firms' cost claims that were disallowed by the regulator when determining the maximum revenue. We then attempt to explain this fraction by using categorical variables representing the regulator, the industry and the time period. Our empirical results suggest that we can explain fifty per cent of the variance in the sample by using these simple categorical variables. Moreover, our results suggest that despite the differences in the implementation of price regulation across regulated industries and across jurisdictions in Australia, outcomes are surprisingly consistent. For example, we show that it is not possible to reject the hypothesis that the regulatory outcomes in South Australia, New South Wales, the Australian Capital Territory and Victoria are similar. In the same vein, we observe that regulatory outcomes in transmission (electricity and gas) are similar to each other and so are the outcomes in distribution (electricity and gas). We also find that the nature of ownership of regulated firms (private vs. public) has little impact on the proportion of disallowed cost claims.

Keywords: price regulation, energy, water, consistency.

JEL: L51, L94, L95

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1. Introduction

The Productivity Commission (2004-a) estimates the total value of government-owned assets in water (including sewerage and irrigation), electricity, rail, ports and urban transport at approximately \$125 billion. If one adds the value of total assets of the telecommunications and gas industries and the value of total assets in these industries under private ownership, it is possible to conclude that the total value of assets in the energy, water, telecommunications and transport industries add up to over \$150 billion.

These industries underwent significant changes in the 1990s along the lines prescribed by the Hilmer report. These changes included privatisation, corporatisation, and vertical separation of government owned enterprises. The separation of natural monopoly components from segments where competition could be introduced was accomplished either by actual separation or by the requirements of firms to unbundle the goods and services they provide.

The natural monopoly segments were re-regulated with the introduction of industry specific access regimes and the establishment of independent regulators. Competitive segments were subjected to industry specific regulatory frameworks and of course were also subjected to competition law.

For example, the electricity industry, which was previously characterised by vertically integrated firms, was restructured and divided into generation, transmission, distribution and retail businesses. The natural monopoly elements of the industry, distribution and transmission, were subjected to price regulation and, in principle, the other two elements of the industry, generation and retail, were de-regulated with the requirement that generators sell and retailers buy their electricity through the electricity spot market (the pool).¹

Price regulation of the natural monopoly elements of these industries usually takes the form of maximum prices that these businesses are allowed to charge for the services they provide.² Who sets these maximum prices and how they are set depends very much on the industry.

¹ The practice, however, is more complex. For example, retail prices have remained regulated despite the introduction of full retail contestability in many jurisdictions. Similarly, there are many services associated with the distribution of electricity (e.g., remote meter reading) that might not be natural monopolies. In the same vein, new (and existing) transmission links might not be natural monopolies in as much as they can compete with existing links.

² In this discussion we ignore the issue of service regulation. This is an area that has evolved over the last couple of years where in addition to maximum prices that businesses can charge, there are some minimum standards that have to be satisfied. For example, in electricity distribution, there are minimum requirements for reliability (e.g., number of minutes of interruptions of

For example, the maximum prices that can be charged by electricity and gas transmission businesses are set by the Australian Competition and Consumer Commission (ACCC)³. Economic regulators in the states and territories set the maximum prices to be charged by gas and electricity distribution and water businesses.

In Australia, the dominant regulatory practice is such that maximum prices are not set directly. Instead, regulators determine the efficient costs to provide a particular service (usually in a forward looking manner – for example, for the next five years) and this generates the maximum allowable revenue that a business can generate. This model is known as the building blocks approach to price regulation. Very significantly, these efficient costs include the costs on and of capital, in addition to operational expenditures.

Based on the maximum allowable revenue, prices of individual services are then calculated by using, for example, forecasted demand or the quantities observed in previous periods. That is, prices are linked to costs through the maximum allowable revenue and the demand function.

Although the general principles for setting prices are similar across different jurisdictions and different industries, there still remains scope for significant differences on how these principles are implemented.

For example, the allowed rate of return, which is embedded in the determination of efficient capital costs, varies quite considerably across jurisdictions and industries.⁴ Other examples that illustrate the scope for variation in the implementation of price regulation include the existence of efficiency carryover mechanisms in some jurisdictions and for some industries⁵, different rights of

service per year) and some regulators have imposed penalties and bonuses associated with accomplishing these service requirements.

³ With the exception of some significant gas transmission pipelines inside the Western Australian state boundary and for electricity transmission in Western Australia and the Northern Territory.

⁴ See, for example, NECG (2003) for an international comparison of rates of return in regulatory decisions.

⁵ To illustrate how these mechanisms work, consider a five-year regulatory period. In many jurisdictions, if a firm spends less than its allowable efficient costs say in the fourth year of the regulatory period, then the firm can retain the additional profits for only one more year, with the new prices being set at the lower efficient cost. This of course might lead a firm to postpone process innovations that reduce costs until the beginning of the new regulatory period. An efficiency carryover mechanism instead allows the firm to carry over the cost savings for the next five years.

appeal across industries⁶, and whether maximum prices are determined by a revenue cap or a weighted average price cap.

One could take this diversity of approaches to price regulation across jurisdictions and across industries as a *prima facie* case of regulatory mayhem. In this paper we provide some evidence to suggest that this conclusion would be premature. In particular, we assemble a database containing fifty-two regulatory decisions across electricity and gas transmission and distribution and water. For these decisions, we construct a variable that reflects the difference between the regulated firms' cost claims and the maximum revenue allowable by regulators.

The basic idea is best illustrated by a simple example. Consider two such decisions: decision A and decision B. If we could control for all objective differences between these two decisions (for example, by controlling for the regulator, the industry, the point in time at which the regulation decision is made, etc), then we should expect decisions A and B to be consistent, that is, they should yield the same ratio of cost claims to allowable revenue. Another way to express the same idea is to say that if we had the same regulator making decisions A and B in the same industry, regarding the same firm and in the same year, then we would expect the two decisions to be the same. That is, our task is to examine the extent to which price regulatory decisions have been applied consistently across industries and across jurisdictions in Australia.

In this paper we provide evidence that despite the differences in the implementation of price regulation across regulated industries and across jurisdictions, it is not possible to reject the hypothesis that the regulatory outcomes in South Australia, New South Wales, the Australian Capital Territory (ACT) and Victoria are similar. We also provide evidence that the Queensland and Western Australia regulators are consistent with one another, but are associated with regulatory outcomes that seem tougher than those of the regulators in South Australia, New South Wales, Victoria, and the ACT, controlling for the industry and the time period.

Finally, we would like to be able to assess how the regulatory decisions taken by federal regulator, the ACCC, relate to those taken by the state regulators. The difficulty in conducting this assessment is the lack of overlap in the industries being regulated. We provide some lower and upper bounds that are consistent with both the notion that the ACCC is tougher and that it is less tough than state regulators.

⁶ Firms in the gas industry, for example, can appeal to the Australian Competition Tribunal on merit grounds. In contrast, there is no provision for appeals on merit grounds for firms in the electricity industry.

Our paper fits naturally with a recent literature that aims to explain the variability of regulatory outcomes. For example, Figueiredo, Jr. and Edwards (2004) observe that regulated prices for access to the local loops of incumbent telephone networks vary substantially from one US state to another and across time. This difference remains even after controlling for technological and geographic cost considerations.⁷ These authors find that within state variation in political and institutional environment can explain part of the variability.

In a similar vein, Edwards and Waverman (2004) study regulated interconnect rates paid by entrant firms to incumbent firms in EU telecommunications. Again interconnect rates are in principle set with regards to costs. However, these authors find that public ownership of the incumbent positively affects these interconnect rates, although the presence of institutional features enhancing regulatory independence mitigates this effect.

Now that we have explained what this paper does, it is appropriate to explain what this paper does not do. While we provide evidence that price regulation has been reasonably consistent across industries and jurisdictions (with some exceptions), our analysis is silent on how effective this regulation has been. This is an important theme for future research.⁸

This paper is organised as follows. In the next section we provide some brief description of the institutional framework of each of the industries that we analyse. Section 3 contains the conceptual framework and a description of our empirical strategy. Section 4 describes the database that we assembled and presents our empirical results. In Section 5 we investigate whether the nature of ownership of regulated firms can explain the variability of our endogenous variable. Section 6 concludes.

⁷ After all, regulators are required to set prices with reference to economic criteria -- primarily some measure of costs.

⁸ The recent Productivity Commission Review of the Gas Access Regime (Productivity Commission, 2004-b) provided an opportunity for an evaluation of regulatory outcomes. In our view, the review highlighted that there is no perfect approach. For example, more investment is not necessarily an indicator of regulatory success – an effective regulatory system may increase the efficiency and/or length of life of capital and therefore reduce investor requirement. Similarly, reductions of prices to consumers may not be an indicator of regulatory success as lower prices might result in lower levels of reliability and innovation. Our approach suggests that it might be possible to explain how investments (WACC, etc.) are determined and, therefore, to investigate the effects of regulation on outcomes.

2. The Institutional Framework

The institutional arrangements that have prevailed since the deregulation of the network utility sectors have seen regulatory responsibilities spread between State, Territory and national regulators. Even within industries, different segments of the supply chain have been regulated by different regulators and at different jurisdictional levels. This practice has seen distinct implementations of the underlying principles of price regulation.

The remainder of this section will describe the different regulatory frameworks that apply for the industry sectors covered in this study.

Electricity

The responsibility for electricity regulation in Australia has been divided amongst State, Territory and national regulators since the introduction of deregulation. As part of the deregulation process a National Electricity Market (NEM) was developed. This market comprises Queensland, New South Wales, Australian Capital Territory, Victoria and South Australia. Tasmania will also physically join the NEM once the Basslink Interconnector is commissioned. Jurisdictions in the NEM are required to regulate the electricity industry according to an industry access code developed under Part IIIA of the *Trade Practices Act 1974*; the National Electricity Code (NEC).

Price regulation for transmission networks is conducted according to Part C of the NEC, while Part E prescribes the rules for distribution pricing. Price regulation under the NEC is focused on an incentive based mechanism that applies a CPI-X approach. The regulation of electricity transmission companies in NEM jurisdictions is currently conducted by the ACCC. Distribution companies are regulated via the relevant State or Territory based economic regulator.

While the ACCC regulates electricity transmission under the NEC, there is sufficient scope within the NEC to allow the ACCC to interpret regulatory pricing components as it wishes. Therefore, consistent with the introductory explanation to Chapter 6 of the NEC, the ACCC has been developing a Statement of Regulatory Intent. This Statement, currently still in draft form, is known as the 'Draft Statement of Principles for the Regulation of Transmission Revenue'. The purpose of this document is to provide clarity to market participants on how the ACCC intends to regulate transmission companies.

Section 6.11(e) of the NEC allows State-based regulators to develop alternative pricing principles to those set out in Part E of the NEC. As a result, the form of

regulation has developed differently amongst State-based regulators. For example, while the NSW regulator has applied a revenue cap regime, the Victorian regulator has applied a price cap regime. In addition, other incentive based mechanisms of the regulatory regime can also vary. For instance, Victoria is currently the only jurisdiction to apply a service incentive scheme and an efficiency carryover mechanism. These instruments are designed to promote efficiency by allowing the businesses to hold onto efficiency benefits achieved while also setting service quality targets to ensure that an appropriate level of service is maintained.

For those jurisdictions that are outside the NEM, State-based regulation applies for both transmission and distribution regulation. Increasingly, non-NEM states are moving towards regulatory regimes similar to the NEM style of price control.

Gas

Gas industry regulation in Australia is conducted under the National Third Party Access Regime for Natural Gas Pipelines (the Gas Access Regime). This regime applies to third party access to natural gas transmission and distribution pipelines. Underpinning the Gas Access Regime is the National Third Party Access Code for Natural Gas Pipeline Systems (the Gas Code). Unlike for electricity, the Gas Access Regime operates in each State and Territory through the corresponding gas law.

The Gas Access Regime in Australia only applies to pipelines that are 'covered' under the regime. That is, covered pipeline operators are required to have an access arrangement in place. Transmission pipeline access arrangements are the responsibility of the ACCC⁹, while distribution pipelines are the responsibility of State or Territory based economic regulators. As a result, differences in interpretation of the Gas Code can evolve over time.

Water

Water regulation in Australia is conducted on a State and Territory basis with different jurisdictional arrangements applying between States and Territories. Generally there has been a trend over recent years for water pricing regulatory frameworks to move towards a user pays system to reflect the scarcity of the resource. Water pricing decisions usually consider bulk water, storm water, wastewater as well as general water supply services. Water price regulation is conducted under specific State and Territory based water legislation with regulatory powers provided through the legislation specific to the regulator.

⁹ Except for Western Australia.

3. The Analytical framework and the empirical strategy

Our aim is to examine the consistency of regulatory decisions across jurisdictions and across industries. In particular, we want to explain the relationship between firms' cost claims and the regulator's allowable costs as a function of variables such as the nature of the industry, the regulator, and the time period.

That is, we are mainly interested in the difference between Y -- defined as a firm's cost claims measured in dollars -- and MAR -- the maximum allowable revenue. As we want our measure of firms' cost claims to be unit free, we instead define the following variable:

$$(1.1) \quad y_t = \frac{Y_t - MAR_t}{Y_t}$$

These variables are indexed by t , which denotes the year for which the cost claim has been made. Note that in principle we have $0 < y_t < 1$ as in one extreme the regulator can set the maximum allowable revenue to exactly cover the firm's cost claims making $y_t = 0$.¹⁰ In the other extreme, the regulator sets the maximum allowable revenue to zero making $y_t = 1$. Alternatively, $y_t = 0.5$ indicates that for this particular year and this particular decision, the firm was allowed to recover fifty per cent of the costs it claimed. Similarly, $y_t = 0.3$ indicates that for this particular year and this particular decision, the firm was allowed to recover seventy per cent of the costs it claimed.

Variable y , the fraction of firms' cost claims that are disallowed by the regulator, is what we aim to explain. The interpretation of y , however, is not trivial. For example, if regulators had access to an *efficiometer*, a clever machine that measures precisely the extent to which firms' cost claims are efficient, then y could be interpreted as a measure of firm's deviation from the efficiency frontier; a higher y indicating a more inefficient firm. By the same token, in the absence of an *efficiometer* and if firms' behaviour across industries were the same, then y can be interpreted as a measure of the toughness of the regulator, a higher y indicating a tougher regulator. In our approach, we control for the possibility that the behaviour of firms in gas distribution is different from the behaviour of firms in gas transmission or electricity or water. We also control for the possibility that different regulators behave differently and we allow their behaviour to change over time.

¹⁰ In practice it is possible to observe $y_t < 0$. This can be the result, for example, of the regulator allowing the firm to anticipate to period t certain expenses that would be incurred at a later date.

That is, we estimate the following equation

$$(1.2) \quad y_{irt} = \alpha + RD_r' \beta + ID_i' \gamma + TD_t' \delta + \varepsilon_{irt},$$

where subscripts irt indicate, respectively, the industry, regulator and time of the decision, RD are dummy variables indicating which regulator took the decision, ID are dummy variables representing the industry to which the decision applies, and TD are dummy variables representing the time period¹¹. **a**, **b**, **d** and **g** are parameters to be estimated while ε_{irt} is a random term. We estimate the model with different restrictions on the correlation of ε_{irt} below. The model may be viewed as a three-way error component model. A typical two-way model would have an effect for industry and one for time. Here we also have a regulator effect. The results are described in the next section. Below we simply describe the pattern of our dependent variable over regulator, industry and time of regulation.

Figures 1a and 1b report the behaviour of y across the seven regulators under consideration. The raw data suggests some consistency across state regulators with the exception of the Western Australia regulator whose pattern of the y variable is somewhat similar to that of the ACCC.

Figure 1a: Value of y by regulator

¹¹ For example, consider a decision by the ACT regulator regarding gas distribution in 2002. In this case, the dummy variables representing the ACT regulator, the gas industry and the year 2002 will all have a value equal to one, whereas all other dummy variables will be equal to zero.

Figure 1b: Value of y by regulator

Blocks show 50% of values closest to mean. Bars show full range of values.

Figures 2a and 2b report the pattern of our dependent variable across the five industries under consideration. The raw data suggests a similarity between gas and electricity within distribution and transmission but indicate a clear distinction between transmission and distribution.

Figure 2a: Value of y by industry

Figure 2b: Value of y by industry

Figure 3 reports the pattern of our dependent variable over time. No particular trend seems to arise. Figure 4 is an estimate of the density of y using non-parametric, kernel density estimation. We note the bimodality in the distribution of y and we explore this below.

Figure 3: Value of y over time

Figure 4: Distribution of y

4. The Data and Empirical Results

The data used in this study is presented as the revenue requirement of the business compared to the revenue determination of the regulator. The data is presented on a financial year basis over the corresponding regulatory period. Those decisions that are made on a calendar year basis are presented as the earliest financial year that corresponds to the calendar year to provide simplicity.

The method used to obtain the data was to search the websites of all Australian utility regulators for their regulatory pricing determinations. Therefore, the data is limited to those decisions where the regulator has provided the information of both the proposal and the determination on the Internet. In most cases the business proposed revenue requirement and the regulators maximum allowable revenue determination were found in the regulator's Final Decision report for that business or industry. In some instances the businesses proposed revenue requirements were not available in the Final Decision, when this was the case the businesses initial submission was used to obtain the data.

The data that we use contains information on firm cost claims and allowable revenue set by the regulator for 254 annual observations on 52 separate projects (decisions). (The average decision/project covers 5 years.) The database and the STATA code for reproducing the results are available at www.acore.org.au.

Tables 1 and 2 summarise the data by industry and regulator.

Table 1. Observations (decisions) by regulator and industry

	Regulator						
Industry	ACCC	Vic	NSW	QLD	WA	SA	ACT
Electricity Transmission	49(8)	0	0	0	0	0	0
Electricity Distribution	0	20(4)	30(6)	10(2)	0	0	10(2)
Gas Distribution	0	35(7)	14(3)	12(2)	5(1)	4(1)	10(2)
Gas Transmission	28(6)	0	0	0	10(2)	0	0
Water	0	0	13(5)	4(1)	0	0	0

Table 2. Mean of y by regulator and industry

Industry	ACCC	Vic	NSW	QLD	WA	SA	ACT	
Electricity Transmission	.195							.195
Electricity Distribution		.146	.080	.017			.093	.092
Gas Distribution		.096	.115	.088	.054	.146	.137	.103
Gas Transmission	.139				.448			.221
Water			.041	-.040				.022
	.175	.114	.080	.041	.317	.146	.115	.130

Before we present our empirical results, it is worth commenting on some peculiarities of the data. Firstly, in four ACCC decisions (two in electricity transmission and two in gas transmission), the firm's claim covered an entire year but the allowable revenue only covered half of the year (ElectraNet, 2002; SPI Powernet, 2002; Epic Moomba to Adelaide, 2000; EAPL Moomba to Sydney, 2003). To include these years, we multiplied the allowable revenue by two and used the firm's annual cost claim. Omitting these half-year observations has only the most trivial effect on the results presented below.

There were five decisions which we hesitated to include either because the firm reported multiple cost claims and we were unsure which cost claim(s) formed

the basis of the regulator's decision or because we had other doubts about the data quality. These decisions, which we discuss in more detail below, are: Gladstone Area Water Authority (QCA), TXU (Esc-Victoria), Australian Inland (IPART), Energex (QCA), and Ergon (QCA). The estimation results presented below include these decisions (based upon our best guess of which cost claims to use). We also dropped these decisions and re-estimated our models, but none of the coefficients change sign or significance.

In the Energex and Ergon decisions, there were several different proposals by the firm. In the case of the other three decisions, we have an anomalous situation where the sum of the maximum allowable revenue over the entire regulatory period exceeds the firm's claims. There are possible explanations for this. For example, it is possible that demand might have been underestimated in the original firm's submission and that the regulator's decision process revealed this.

An additional peculiarity of the data is that there are no observations on y between .31 and .4. There are 20 observations above .4. They are generated by three projects: MTC (Electricity Transmission, ACCC, October 2003); Goldfield Gas Pipeline (Gas Transmission, Offgar, April 2001); and Dampier to Bunbury (Gas Transmission, Offgar, May 2003). These three projects create the bi-modality in the data which can be observed in Figure 4. We will later present hypothesis tests of our main hypothesis using only the state-regulation data from Gas Distribution, Water and Electricity Distribution (See Table 5). This effectively estimates the model only on a subset of the data in the first mode which appears to be roughly normally distributed. It is worth noting that this does not affect our results.

To summarise, the results presented below include all the decisions from our database. Moreover, if we omit all the peculiar data, as described above, our estimates do not change in any significant way.

We now present and discuss our initial results. The second column in Table 3 reports the results of estimating equation 1.2 by Ordinary Least Squares (OLS) regression. Note that water is the omitted industry dummy and the ACCC the omitted regulatory agency. Therefore, the coefficients on the variables have to be interpreted as relative to the omitted dummies. A positive coefficient implies a less favourable treatment of firms' claims vis-à-vis the omitted categories.

The third column of Table 3 corrects for the fact that our data consists of 254 observations from 52 different regulatory decisions and as such the individual observations are not independent. While the standard errors change by a factor of two or three in some cases, these do not generate any substantive differences in the significance of coefficients between the two columns.

Both regressions include time dummies. We group years 2009-2012 (5 observations on two projects) and use this as the omitted category. All of the time dummies for 1997 through 2008 are negative and significant. If we include separate time dummies for 2009, 2010, and 2011, they are—unsurprisingly—not significantly different from zero, further confirming our decision to group these dummies. Refinements such as replacing the time dummies with a time trend have no significant effect on the coefficients of interest.

The results reported in Table 3 suggest that gas and electricity distribution are treated similarly despite being regulated by different regulators at the various states and territories. By the same token, gas and electricity transmission seem to be treated similarly. It is obvious from the coefficients and their standard errors that these three statements are confirmed by a formal hypothesis test.

Table 3. Coefficient estimates of 1.2

	OLS Regression	OLS Regression with clustered standard errors
Industry		
Electricity Transmission	.511** (.061)	.511** (.064)
Electricity Distribution	.067** (.026)	.067* (.029)
Gas Distribution	.076** (.028)	.076** (.030)
Gas Transmission	.471** (.057)	.471** (.031)
Regulatory Agency		
Victoria	.372** (.054)	.372** (.038)
NSW	.358** (.056)	.358** (.036)
Queensland	.306** (.056)	.306** (.047)
Western Australia	.306** (.034)	.306** (.025)
South Australia	.395** (.070)	.395** (.024)
ACT	.366** (.057)	.366** (.034)
R-squared	50.5%	50.5%
Sample size	254	254

** Significant at 5% level

* Significant at 10% level

Another striking feature of the results from Table 3 is the similarity between the coefficients of the various state and territory regulators. This suggests that despite the many differences in approaches to the regulation of gas and electricity distribution and water across states and territories, their behaviour might be nevertheless consistent with each other. Below we pursue this similarity more formally.

Finally, note that the positive coefficients on all dummy variables for state regulators would suggest that their decisions are less generous than that of the ACCC, the omitted variable. However, to understand this relationship one needs to take into account that the ACCC regulates gas and electricity transmission and the coefficients on these variables were substantially higher than the coefficients on the gas and electricity distribution variables. It is also important to note (see Table 1) that all electricity transmission decisions included in our database were taken by the ACCC whereas gas transmission decisions were taken both by the ACCC (six decisions) and the Western Australian regulator (two decisions).

4.1 Testing regulatory consistency

Using the above regression results, it is straightforward to test whether the different state-based regulatory outcomes are consistent with one another. There are two ways in which we approach this question. The first is to consider pairwise tests between the coefficients for the different state regulators. The second is to consider testing the equality of similar-appearing groups of states/territories.

In Table 4 we present the p-values from the tests of pairwise comparisons across states and territories. The p-values tell us the exact size of the test of equality. Thus a p-value of .2 indicates that we would just reject the test of equality with a test of level .2. (We would reject equality at the 80% confidence level.) The tests of Table 4 use the standard errors which are corrected for clustering.

Table 4: Test of equality of state/territory coefficients

	VIC	NSW	QLD	WA	SA	ACT
VIC		.69	.13	.02**	.47	.84
NSW			.17	.07*	.20	.81
QLD				.99	.04**	.13
WA					.00**	.02**
SA						.26
Test of equality of SA, VIC, NSW and ACT						.55

p-values of test of coefficient equality

**different at the 5% level

We also present the p-value for the test of joint equality between South Australia, New South Wales, Victoria, and the ACT. We can not reject the consistency of these four regulators. Nor can we reject the consistency between Queensland and Western Australia.

The state-by-state comparisons also lend support to their being two groups – one formed of Queensland and Western Australia and the other of the remaining state and territory regulators. When we use the standard errors from the standard OLS regression, we get a strong rejection of the equality of Queensland compared individually to New South Wales, Victoria, and the ACT. When we use the standard errors corrected for clustering we get p-values between .13 and .16. At the 10% level, if we applied a one-sided test that the Queensland is associated with a higher y than the ACT, South Australia, New South Wales, and Victorian regulators, we would conclude that this is indeed the case.

Western Australia is the only state that regulates gas transmission and it may be that the coefficient for Western Australia is heavily influenced by these observations. Therefore, to verify the validity of the above conclusions, we re-estimate the model using only the observations involving electricity and gas distribution and water. These are the main industries regulated by states (see Table 1) and the industries where for each industry there are at least two states involved in regulation.

In Table 5, we present the p-values from the tests of state-by-state equality and the grouped equality of South Australia, New South Wales, Victoria, and the ACT. (Regression results are available from the authors.) Our tentative conclusions that Queensland and Western Australia are consistent with one another, but associated with lower y s than South Australia, New South Wales, Victoria, and the ACT (who are consistent with one another) is sharpened.

**Table 5: Test of equality of state/territory coefficients
(Excluding gas transmission from industries considered)**

	VIC	NSW	QLD	WA	SA	ACT
VIC		.90	.13	.01**	.56	.56
NSW			.099*	.02**	.42	.42
QLD				.90	.046**	.03**
WA					.00**	.00**
SA						.96
Test of equality of SA, VIC, NSW and ACT						.82

p-values of test of coefficient equality

**different at the 5% level

The difficulty in assessing whether the ACCC is associated with higher or lower y s than the state regulators is the lack of overlap in the industries being regulated. The significant, positive coefficients on the state regulators in table 3 indicate that the ACCC is less tough than the state regulators. But the large significant coefficients on gas and electricity transmission (mostly regulated by ACCC in the case of the former and only by ACCC in the case of the latter) may be interpreted to mean that the ACCC is tougher.

Holding year constant, electricity transmission regulated by ACCC has an average value of y predicted from the model of .405. (Without the constant and year effects, both of which are negative.) Electricity distribution regulated by NSW has a predicted value of y of .332. The difference is significant, but we are econometrically unable to split the difference into that due to the regulator and that due to the fact that the industry being regulated is different. There are no examples of state-regulated electricity transmission (or ACCC regulated electricity or gas distribution or water) that would allow us to split this difference into these two pieces. The coefficients in table 3, by omitting ACCC, attribute all of the difference to the industry and none to the regulator.

In Table 6, we present the polar opposite case, where all the difference is attributed to the regulator and none to the industry. We impose common coefficient on New South Wales, ACT, and Victoria (confirmed by a test of equality). That is, the equation we are estimating is

$$(1.3) \quad y_{irt} = \alpha + RD_i' \beta + TD_t' \delta + \varepsilon_{irt},$$

Table 6. Coefficient estimates of (1.3)

	OLS Regression with clustered standard errors
Regulatory Agency	
Victoria/ACT/ New South Wales (grouped)	-.065* (.036)
South Australia	-.019 (.030)
Western Australia	.152 (.116)
Queensland	-.125** (.047)

If we test the hypothesis of equality of the coefficient on the New South Wales/ACT/Victoria group against the ACCC, we reject the null in favour of the alternative that the ACCC is tougher at the 10% level (p-value is .07). Likewise the ACCC is tougher than Queensland. There appears to be no difference between the ACCC and South Australia, although it's notable that there are few observations for South Australia.

Both the ACCC and Western Australia appear tougher than the other states, although this may be driven by differences between the regulation of gas transmission (only done by Western Australia and the ACCC) and other industries. These differences are evident in the means presented in Table 2. Again, we have no statistical way of separating out these differences.

4.2 Private vs. Public Ownership

A common view is that privately owned firms might play the regulatory game more aggressively, by overstating their costs, than publicly owned companies. The underlying reason is that as shareholders individuals might be more profit-driven than the government. A contrary view suggests that private companies might actually be less capable of overstating their costs given that they are subjected to more public scrutiny (e.g., by their many shareholders) than their public counterparts.

To pursue this issue we split our sample according to the nature of ownership (public vs. private). Tables 7 and 8 summarise the data. There is a small difference between regulatory decisions across privately and publicly owned companies.

Table 7. Observations (decisions) by private/public and industry

	Regulator						
Industry	ACCC	Vic	NSW	QLD	WA	SA	ACT
Private	65 (11)	35 (7)	48 (12)	20 (4)	15(3)	0	20(4)
Public	12 (3)	20 (4)	9 (2)	6 (1)	0	4(1)	0

Table 8. Mean of y by regulator and private/public

Industry	ACCC	Vic	NSW	QLD	WA	SA	ACT	
Public	.131	.146	.097	.172		.146		.137
Private	.183	.096	.076	.001	.317		.115	.128
	.175	.114	.080	.041	.317	.146	.115	.130

To investigate whether this difference in the descriptive statistics has any effect on our substantive results or increases the explanatory power of our model, we re-estimate equations (1.2) and (1.3) incorporating this new categorical variable. The private variable is negative and significant in equation (1.2)--consistent with the lower y for privately-owned firms in the descriptive statistics. Inclusion of the private variable only seems to affect the results for South Australia. The significant differences between South Australia and Queensland and South Australia and Western Australia become marginally insignificant. However, we continue to find that South Australia can be grouped with Victoria, New South Wales and the ACT. In every other respect our substantive conclusions remain the same. In equation (1.3), the private variable is insignificant. The complete regression results are available from the authors.

5. Discussion and Conclusion

The issue of regulatory consistency – the notion that regulatory decisions should not favour particular industries or firms in particular jurisdictions – has been raised as one of the rationales for the establishment of the new Australian Energy Regulator. This is not surprising given the different approaches to the implementation of price regulation in electricity and gas distribution and transmission across jurisdictions. Similarly, a national water policy is again a high priority in the political agenda and the scope for significant differences in price regulation across jurisdictions might result in distortions in the implementation of competition policy arrangements.

In this paper we provide evidence that despite the differences in the implementation of price regulation across industries and across jurisdictions in Australia, there is a considerable degree of consistency in regulatory decisions.

Firstly, our results suggest that when we control for different regulators and different time periods, regulatory decisions are reasonably consistent across the electricity and gas distribution industries. The apparent lack of consistency between transmission and distribution has to be taken more cautiously given that the ACCC is the only regulator for electricity transmission in our sample and so it is impossible to statistically separate the regulator and industry effects.

Secondly, it is not possible to reject the hypothesis that the regulatory outcomes in South Australia, New South Wales, the ACT and Victoria are similar. We also provide evidence that the Queensland and Western Australia regulators are consistent with one another, but are associated with regulatory outcomes that seem tougher than those of the other state regulators.

This empirical evidence of course does not allow us to conclude that initiatives such as the establishment of the Australian Energy Regulator are not necessary – indeed the new national regulator might result in a reduction in the direct costs of regulations by eliminating duplication of efforts – but instead it highlights an important topic for further investigation: the mechanism by which this consistency in price regulation has been achieved. For example, is it the case that there exists a follower/leader relationship where some state regulators set the tone for other state regulators?

Furthermore, we find the nature of ownership of regulated companies does not affect the conclusions stated above. Moreover, on its own, the public/private variable has no statistically significant influence on the percentage of costs which the regulator allows the firm to recover.

Finally, we would like to be able to assess how the regulatory decisions taken by the federal regulator, the ACCC, relate to those taken by the state regulators. The difficulty in conducting this assessment is the lack of overlap in the industries being regulated. We provide some lower and upper bounds that are consistent with both the notion that the ACCC is tougher and that it is less tough than state regulators.

The implicit assumption we make when interpreting our results is that any gaming behaviour by firms (in overstating their costs) that is attributable only to a particular industry is captured by the industry specific dummies. Similarly, any gaming behaviour that occurs only when dealing with specific regulators is captured by the regulator specific dummies. So our interpretation is still valid in the presence of gaming behaviour, provided that this behaviour is roughly constant across one of our included categories (time, industry, and/or regulator).

If one takes the extreme view that regulators do own an *efficiometer* and can determine precisely the true efficient costs, then our conclusions should be interpreted as establishing that gaming or overstatement of costs is consistent across jurisdictions and across gas and electricity distribution. Of course, if this were true, our conclusion would have to be re-stated in terms of consistency of gaming behaviour – although this consistency of gaming has no impact on outcomes given the assumption that regulators possess an *efficiometer*.

In addition, it is important to note that although we are able to explain fifty per cent of the variation on the data by using some very simple categorical variables (regulator, industry and time), there is still fifty per cent of the variance left to be explained! This is also a subject of further research.

Further research will aim at extending the database to include observations from the UK, for example, where electricity transmission and distribution are regulated by the same regulator. Moreover, we intend to expand the dataset to include decisions in other industries such as transport and telecommunications and to include some political economy variables. This would allow us not only to answer the question relating to the ACCC but possibly also to uncover firm-specific behaviour.

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