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The price cap regulation paradox in the electricity sector

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ABSTRACT

PCR has experienced widespread adoption in the U.S. telecommunications industry, but not in the electricity sector. Important institutional differences between the two sectors and the specific manner in which PCR has been implemented in the U.S. may help to explain this outcome. Changes to the standard implementation of PCR might promote its adoption in the electricity sector.

1. Introduction

It is generally accepted that economic regulation should seek to emulate competitive market outcomes.[1] Price cap regulation (PCR) is generally deemed to be superior to traditional rate of return regulation (RORR) in accomplishing this objective because RORR can induce excessive infrastructure investment, limit innovation, and encourage inefficient production technologies and excessive diversification into unregulated markets.[2] PCR allows the prices the regulated firm charges for its services to diverge from costs for a specified period of time. By limiting the extent to which cost increases can be passed on to consumers in the form of price increases, PCR can provide the regulated firm with strong incentives to innovate and reduce its operating costs.

These observations introduce a paradox. If PCR is a superior form of economic regulation quite generally, why do we observe widespread adoption of PCR in the U.S. telecommunications industry, but not in the transmission and distribution segments of the electricity sector? The purpose of this article is to propose two complementary explanations for this apparent paradox. The explanations pertain to important institutional differences between the two sectors and to details of a common implementation of PCR in the U.S. We also suggest modifications of standard implementations of PCR that may enhance its appeal in the electricity sector.

Before developing these explanations in detail, we briefly review the U.S. experience with PCR and with other alternatives to RORR, which are often referred to collectively as performance-based regulation (PBR).

1.1. PCR adoption in the telecommunications and electricity sectors

During the past few decades, the vast majority of U.S. states have abandoned RORR in favor of PCR in their telecommunications sectors. By 2003, 40 of the 50 states had adopted PCR. Furthermore, once a state adopts PCR, it almost never reverts to RORR.[3]

This contrasts sharply with the experience in the electricity sector. The number of U.S. states employing broad-based PBR plans in the electricity sector decreased from 16 in 2000, to 10 in 2003, to five in 2007.[4] Broad-based plans were replaced in part by more targeted plans that explicitly link increased earnings prospects to

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[1] Alfred Kahn, THE ECONOMICS OF REGULATION: PRINCIPLES AND INSTITUTIONS, Volume I, New York: John Wiley and Sons, 1970 at 17; and James Bonbright, Principles of Public Utility Rates, New York: Columbia University Press, 1961 at 107.

[2] For an overview and summary of the relevant economics literature, see Mark Armstrong and David Sappington, "Recent Developments in the Theory of Regulation," in Mark Armstrong and Robert Porter (eds.), *The Handbook of Industrial Organization,Volume 3*. Amsterdam: Elsevier Science Publishers, 2007 at 1557–1700.

[3] David Sappington and Dennis Weisman, "Price Cap Regulation: What Have We Learned from Twenty-Five Years of Experience in the Telecommunications Industry?" *Journal of Regulatory Economics*, 38(3), December 2010 at 15. The widespread adoption of PCR may be explained by the fact that PCR can be designed to provide gains to all interest groups. Dale Lehman and Dennis Weisman, "The Political Economy of Price Cap Regulation," *Review of Industrial Organization*, 16(4), June 2000 at 343–356.

[4] Toby Brown, Paul Carpenter, and Johannes Pfeifenberger, "Incentive Regulation: Lessons from Other Jurisdictions," AUC PBR Workshop, Edmonton, Alberta, May 26–27, 2010. For an early survey of PBR trends in the electric power sector, see David Sappington, Johannes Pfeifenberger, Phillip Hanser, and Gregory Basheda, "Status and Trends of Performance-Based Regulation in the U.S. Electric Utility Industry," *The Electricity Journal*, 14(8), October 2001 at 71–79. A broad-based PBR plan is one that permits substantial variation in the earnings of the regulated firm and does not link the variation explicitly to particular performance dimensions (e.g., service reliability).

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the firm's performance on specific dimensions (e.g., service reliability). PBR plans in the electricity sector also commonly impose tight bounds on the range in which the regulated firm's earnings can vary.[5]

A recent survey finds that as of 2015, 14 U.S. states employed what are identified as multi-year rate plans in their electricity sectors.[6] Some of these plans link rate increases to increases in capital investment, thereby retaining a key element of RORR.

In summary, the adoption of PCR in the U.S. has been more rapid, more ubiquitous, and more persistent in the telecommunications sector than in the electricity sector. We now suggest two complementary explanations for this phenomenon.

2. The role of institutional differences

Explanation 1. The disparate adoption of PCR reflects institutional differences between the electricity and telecommunications sectors.

Key institutional differences include the following.[7]

2.1. Industry competition

Suppliers of telecommunications services have faced substantial and increasing competition in recent decades. In contrast, the transmission and distribution segments of the electricity sector have experienced relatively little competition.[8] Substantial competitive pressure can promote the adoption of PCR for two primary reasons. First, PCR can provide incumbent suppliers with the pricing flexibility they require to respond to increasing competition. Second, PCR can help to promote industry competition because it prevents incumbent suppliers from increasing prices of monopoly-supplied services to offset losses on competitively supplied services.

2.2. Productivity growth rates

As explained more fully below, PCR often acts like a two-edged sword: it permits a regulated firm to secure substantial earnings if it can readily achieve productivity growth rates that exceed historic growth rates, but can expose the firm to considerable earnings risk if historic productivity growth rates cannot be replicated. Therefore, regulated firms are more likely to embrace PCR in settings where achievable productivity growth rates are increasing over time.

Moore's Law combined with demand growth has supported increasing productivity growth in the telecommunications industry in recent decades.[9] In contrast, stagnant or declining demand[10] coupled with higher production costs (due in part to environmental mandates) may have led to diminished productivity growth in the transmission and distribution segments of the electricity sector.[11]

2.3. Environmental considerations

The limited growth in demand for electricity in recent years reflects in part the promotion of energy conservation policies. Although the price reductions and corresponding increased consumption that PCR can promote are encouraged in the telecommunications sector, they may be viewed less favorably in the electricity sector because they can impede energy conservation efforts.

2.4. Regulatory bargains

Telecommunications suppliers typically provide many services, including basic local telephone service and more discretionary services such as call waiting, caller identification, and broadband Internet access. This combination of offerings can facilitate a "regulatory bargain" whereby the regulator agrees to little or no regulatory oversight of discretionary (and often highly profitable) services in exchange for a stringent cap on the prices charged for basic local telephone service. Electricity suppliers typically enjoy relatively few opportunities for substantial earnings in other sectors. Consequently, regulators cannot promise favorable treatment in other sectors as the *quid pro quo* for PBR plans that deliver substantial benefits to electricity consumers.

2.5. Reliability concerns

High perceived costs of service interruptions can lead regulators to prefer targeted PBR plans to broad-based PBR plans like PCR. The existence of multiple telecommunications networks and the self-healing characteristics of these networks can temper these reliability concerns in the telecommunications industry. Broad-based PBR plans that provide strong incentives for cost

[5] Sappington et al., 2001, Op. Cit. Hemphill et al. observe that "Although there has been significant change in the electricity industry over the past two decades, there has been relatively limited application of incentive regulation to the major services provided." Ross Hemphill, Mark Meitzen, and Philip Schoech, "Incentive Regulation in Network Industries: Experience and Prospects in the U.S. Telecommunications, Electricity, and Natural Gas Industries," *Review of Network Economics*, 2(4), December 2003 at 323.

[6] Mark Lowry, Mathew Makos, and Gretchen Waschbusch, "Alternative Regulation for Emerging Utility Challenges: 2015 Update," Edison Electric Institute, November 2015 at Table 7.

[7] For a more comprehensive discussion of these institutional differences, see David Sappington and Dennis Weisman, "The Disparate Adoption of Price Cap Regulation in the U.S. Telecommunications and Electricity Sectors," Journal of Regulatory Economics, 49(3), June 2016 (forthcoming).

[8] The focus on the transmission and distribution components of the electricity sector reflects the substantial deregulation of electricity generation and utility divestiture of generation assets that have taken place in the U.S. in recent years. Emily Hickey and J. Lon Carlson, "An Analysis of Trends in Restructuring of Electricity Markets," *The Electricity Journal*, 23(5), June 2010 at 47–56.

[9] Moore's Law describes the rapid decline in the cost of computing power, which translates directly into reduced costs of supplying switched telecommunications services. Moore's Law roughly states that "the cost of a given amount of computing power halves every 18 months." Jonathan Nuechterlein and Philip Weiser, *Digital Crossroads*. Cambridge MA: MIT Press, Second Edition, 2013 at 149.

[10] Since the mid-1990s, electricity consumption has increased more slowly than output has expanded in the U.S., reversing a long-standing trend. Richard Hirsh and Jonathan Coomey, "Electricity Consumption and Economic Growth: A New Relationship with Significant Consequences?" *The Electricity Journal*, 28(9), November 2015 at 72–84. Total annual retail sales of electricity in the U.S. increased by less than 5% between January 2001 and January 2015, and declined by almost 2% between January 2010 and January 2015. U.S. Energy Information Administration, *Electricity Data Browser*, Retail Sales of Electricity (http://www.eia.gov/electricity/data/browser/#/topic/5?agg=2,0,1&geo=g&freq=M&start=200101&end=201506&ctype=linechart&ltype=pin&rtype=s&maptype=0&rse=0&pin=), visited September 21, 2015.

[11] The average annual total factor productivity growth rate for the 72 U.S. electricity and gas distribution firms examined in a recent study was 0.85 between 1973 and 2009. The corresponding average annual growth rate between 2000 and 2009 was −1.08. Jeff Makholm, Agustin Ros, and Meredith Case, "Total Factor Productivity and Performance-Based Ratemaking for Electricity and Gas Distribution," Presented at the 31st Annual Eastern Conference of the Center for Research in Regulated Industries, May 2012.