

**Price Cap Policies in the Transition
from Monopoly to Competitive Markets**

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Abstract

Price cap regulation is replacing traditional rate of return regulation in a number of jurisdictions. This development can be viewed as a regulatory mechanism facilitating the transition from monopoly to competitive markets. However, multiple goals cannot be achieved via a single instrument. Pure price caps have been modified to better meet the mix of regulatory objectives. The paper then examines where to place the burden of proof when considering new regulatory procedures. We show that evaluating the impact of price caps and other forms of incentive regulation requires very careful quantitative studies. In addition, to illustrate the complexity of price cap implementation, we consider the importance of initial conditions for the number of baskets to be utilized.

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Price cap regulation represents a possible regulatory mechanism for bridging the transition from monopoly to competitive markets. However, multiple goals cannot be achieved via a single instrument. By reviewing the extent to which price caps facilitate the achievement of traditional regulatory objectives, this paper shows how pure price caps have been modified to better address the mix of regulatory objectives. Then the paper examines where to place the burden of proof when considering a shift away from traditional rate of return regulation. The experiences of British Telecom (BT) and AT&T under price cap regulation, since 1984 and 1989, respectively, have received accolades.¹ At the state level, at least eight states have adopted versions of price caps.² We note that price cap regulation is not as "simple" as some proponents have suggested. In particular, we consider the role of initial conditions in the context of two types of plans -- those where prices of services are capped individually and those where a basket is established. This paper concludes with some observations regarding the introduction of price caps.

1. Price Cap Policies and Regulatory Objectives

The basic rationale for abandoning rate of return regulation in favor of incentive regulation is twofold: to provide more powerful incentives for cost containment and to

¹See Beesley and Littlechild (1989) and Cheah (1991) regarding the British experience; and see the US FCC (1993) for a recent performance review of the AT&T plan.

²BellSouth Telecommunications (1993) reports that RI, CA, MI, ND, NJ, OR, (Rochester) NY, and WV have forms of effective price regulation plans, and AR, AZ, DE, IL, IN, OH, PA, VT, and WI have proposed plans.

facilitate the transition to competitive markets.³ Few would debate these points, but many analysts have raised questions about the design and implementation of price caps. That is, the limitations of traditional regulation had become clear in terms of both theory and practice. The advantages of moving from cost-based to price-based regulation seemed clear in principle. However, actual experience with the new mechanism was necessary before it could be judged a success.

Theory suggested a number of performance improvements that were obtainable from a change in regulatory regime. Braeutigam and Panzar (1989) concluded that price cap regulation

" . . . can induce the firm to minimize costs, produce efficiently in noncore markets, undertake cost-reducing innovation as an unregulated firm would, and diversify into a noncore market if and only if diversification is efficient. Incentives to misreport cost allocations and choose an inefficient technology simply disappear, since cost allocation is not required under this regulatory scheme."

Of course, even as the theory was being fleshed out, we were beginning to observe the actual design of plans and their implementation in practice.

It would be premature to offer a definitive evaluation of price caps in practice, given the limited number of years and industries in which the mechanism has been applied. However, as experience accumulates, we ought to be able to draw conclusions about the shift towards price caps and other forms of incentive regulation. For example, are government administrative costs reduced under new regulatory regimes? Is undue rate

³Since the firm is the residual claimant of all profits, superior incentives for cost reduction and innovation are other desirable properties of theoretical price-cap regulation. Liston (1993) compares rate of return regulation with price cap regulation and discusses pitfalls of implementing either scheme.

discrimination avoided by price caps? Has greater production, allocative, and innovative efficiency been fostered? These questions represent a subset of those associated with Bonbright's (1961) listing of eight rate-making objectives. So we turn to those fundamental regulatory goals and consider how price caps have fared in terms of each objective.

Simplicity and Public Acceptability

The simplicity of price caps seemed to promise real resource savings--both to regulators and firms. Advocates argued that regulation with a "light hand" would utilize competitive pressures where possible, while protecting customers who faced few supply options. A formula offered the possibility of reducing regulatory debates to a few key parameters: plan duration and adjustments for changes in input prices, technology, and key developments outside the firm's control (such as a change in tax rates or depreciation policy). In addition, as Kwoka (1993) has pointed out, the *architectural design of price caps that enable flexibility* requires that attention be given to *baskets, bands, floors, and ceilings*. In some regulatory applications, simplicity has been sacrificed for the achievement of greater public acceptance. These features of price cap plans have emerged to increase the comfort level of key stakeholders--but they add more points for debate and bickering. In addition, it is doubtful that substantial administrative savings have been realized, because parties also have had to develop capabilities to address the second regulatory objective.

Freedom from Controversy

All the terms of the price cap are controversial. The cost of capital was the lightning rod under rate of return regulation. Customers and the firm played a zero-sum game. More for one party meant less for the other. Furthermore, the stylized model of traditional

ROR regulation was a distortion of reality. Doug Jones (1992, p. 127) provided a catalogue of institutional features which discouraged inefficient behavior, ". . . disallowance of imprudently incurred expenses, prudence reviews and application of the used-and-useful test, yardstick performance comparisons, not only with public power but among similarly situated investor-owned utilities, commission-ordered management audits of both the reconnaissance and focused type, judicious employment of regulatory lag, altering the allowed rate of return to induce appropriate utility behavior, [and] occasional and selective jawboning by regulators." The degree of success for promoting cost containment is open to question, but these additional regulatory instruments complicate comparisons between ROR and price cap regulation. These other aspects of traditional regulation indicate that any form of regulation is likely to involve additional instruments as behavioral abuses are identified or concerns regarding performance are made manifest.

The complexity of ROR regulation, with attendant cost allocations and highly choreographed hearings, has parallels in price cap regulation. Numerous issues need to be resolved besides the duration of the cap. For example, how is service quality to be addressed? Similarly, what if "excessive" returns are realized? The regulator's score on the newspaper headline test will depend on perceptions regarding the "deal" and the associated values of formula components.

Thus, the FCC price cap plan for RBOC access charges (rates charged to AT&T, MCI, Sprint, and other interexchange carriers) effective in 1991 utilized a sharing mechanism. This plan overlaid the price cap with an earnings sharing plan so that the IXCs would receive some of the benefits of productivity advances exceeding the 3.3% offset.

Kwoka (1993, p. 741) argued that since the productivity growth ranged from -2.6 to +6.6 percent per year, there was a great deal of uncertainty about opportunities for cost reductions across companies and geographic areas. To avoid excessive returns on interstate access, the FCC viewed it necessary to place a cap on realized returns on investment. Of course, there are still arbitrary cost allocations in determining investment serving interstate calls.

In settings where the firm has superior information about its technological capabilities, there are generally gains to affording firms a choice from a carefully designed menu of possible regulatory alternatives. To improve incentives for cost reduction, the LECs were also given a choice between sharing plans--both of which set 11.25% as a reasonable return. One involved a 3.3% productivity offset (with 50/50 sharing between 12.26 and 16.25% return on investment, where the latter represented a maximum allowed return). The second option involved a 4.3% productivity offset (with 50/50 sharing from 13.26 to a higher cap of 17.25% ROI). All seven RBOCs selected the lower productivity offset and lower potential returns, perhaps because their planned additions to capacity and modernization programs were going to keep return on investment lower over this period.⁴

⁴Sappington (1994, p.p. 258-261) ably summarizes the rationale behind the "revelation principle" and the use of a menu of incentive plan options. "When residual uncertainty exists for the firm, targets, rather than exact performance levels, can be specified, along with reward schedules for deviations from the selected target. Generally, low performance targets are optimally coupled with low rewards, and very modest compensation for exceeding the low target....The key is to make it unattractive for the firm to implicitly understate its capabilities by selecting a very modest performance target and subsequently earn large rewards for exceeding the target." (p. 261)

Another factor complicating the picture is the role of recent entrants and potential suppliers in the regulatory arena. Since these are key participants in the transition to more competitive markets, regulators must address their concerns in the context of the cap. Trade-offs exist between the rate of entry and revenue sufficiency for incumbent firms.

Revenue Sufficiency

The financial viability objective remains unchanged, but competition places new pressures on the partially regulated firm. To some extent, regulatory control over entry conditions strongly influences the incumbent's ability to maintain revenue sufficiency. Dennis Weisman (1994) has shown that considering price caps in the absence of other regulatory policies is problematic. He concludes that incumbents may not adequately understand (or at least appreciate) the complementary role of entry policy: "There is a tendency for the firm to confuse the regulator's commitment not to lower the price cap with the regulator's commitment not to lower market price."(p. 350) This observation regarding regulatory control of entry conditions suggests that once the price cap "deal" has been struck, regulators have no vested interest in the financial viability of the incumbent. They may attend more to the pleas of entrants once core customers are protected from rapid increases in prices.

Are firms being irrational when they press for price caps without sharing rules? One explanation for the preference for no sharing might be that the strategic plans of RBOCs call for substantial network modernization in order to be positioned for future competitive threats. Thus, they will not be in a position to "share" much anyway in the near term. Over

the long term, the no sharing rule may be preferred since regulators could be perceived as less important a determinant of incumbent success than in the past.

Revenue Stability

The revenue stability objective applies to net revenue rather than gross revenue. Dramatic fluctuations in net revenues would cause high variability in the realized rate of return. Addressing alternative ways to support universal access would be an important instrument for this objective. But this is not as addressed directly by price caps. Rather the issue illustrates how competitive pressures constrain the prices that can be offered by LECs. To the extent that arrangements accompanying caps enable incumbents greater freedom to enter new markets, the new revenue sources may promote this objective of revenue stability -- while keeping basic residential rates down. However, good performance in competitive markets will not be a slam dunk for RBOCs.

Price Stability

The number and composition of baskets constrain prices. Thus, stability of a price index is promoted. In addition, further constraints are often introduced, such as a 5% up or down movement per year, establishing floors or ceilings that promote short run price stability for particular services. The cumulative effect over several years can be substantial, however. Blase and Harris (1994) point out that Local Exchange Carrier (LEC) access revenues are \$564 million below what the index would allow for 1991-1993, suggesting that competitive pressures from competitive access providers (CAPs) and cable systems are holding down access rates.

Fairness in Apportionment of Total Costs

Standards for fairness have always been troublesome. Inputs shared by several services could be paid for by a variety of allocation schemes--all of them arbitrary. One could argue that while historical telecommunications cost allocations served politically useful purposes, the advent of new technologies and new entrants exposes incumbent LECs to serious threats. Urban-rural rate averaging is not likely to be sustainable, nor are current levels of access payments from interexchange carriers (IXCs). Hence, price caps have as one advantage the elimination of regulation-driven cost allocation schemes. However, the basic problem of sharing the savings from jointly-used resources does not disappear.

To some extent, the initial conditions for the cap will be part of a political compromise--that incorporates the entire architecture of baskets and side-constraints. Since price caps are adopted partly because we better appreciate how costs are dependent on the regulatory regime itself, to what extent should future cost reductions be flowed back to consumers? Those (exogenous) reductions that would have occurred regardless of the regulatory regime get captured by consumers via an "X" adjustment. For example, the "X" for the LEC access charge is 3.3%, while the "X" for BT increased from 3% in 1984 to 7.5% today. Determining the appropriate productivity offset is just one of the tasks facing regulators who would move towards price caps.

It is interesting to note that Brian Carsberg, the first Director General of OFTEL, stated in his 1985 Annual Report that fairness was not in his domain, "I do not believe, for example that I could properly put forward a proposal for a rule that all people on low incomes should be given telephones free of rentals; such a proposal would involve arbitrary

judgements about matters of income redistribution and my making it would involve the usurping of the proper role of Government, exercised through the Department of Health and Social Security." (para 1.12) However, in 1989 he prodded BT to implement a low user program to promote affordable rates to low income subscribers.

Avoidance of Undue Rate Discrimination

Side constraints such as floors and ceilings on annual price movements address the issue of undue rate discrimination in the near term. The evolution of the BT constraint provides an example of how price cap regulation has evolved over an extended period. Since the UK experience heavily influenced subsequent adaptations in the US, it is instructive to consider how the design of the price cap mechanism has changed over time. Table 1 from Burns (1993) depicts three developments in the UK regime. First, the X-factor has increased over time, from 3 (1984-89) to 4.5 (1989-91) to 6.25 (1991-93) to 7.5 (1993-1997). This tightening of the productivity offset has been viewed by many as an approximation of rate of return regulation: the slow emergence of rivalry in a number of markets implies that BT would earn excessive returns without modification of the offset.

Furthermore, other constraints have been added to the plan over time. Initially, the maximum residential exchange line rental was constrained to $RPI + 2$; the constraint remains the same through 1997. Furthermore, additional constraints have been added to the plan -- limiting increases in connection and installation charges, private circuits, and other items. In 1989, a low usage plan was mandated, with the usage level doubling in 1993. In the 1991 plan, the median residential bill was constrained to increase at the rate of the RPI (Retail Price Index).

Table 1: Changes in Price Cap and Basket Controlled Services

The value of the price cap and date applied	Elements in the basket of services detailed in licence and subject to price control	Other main constraints on services	Services where no price constraint applies	Percentage of BT's turnover under price control
RPI-3 (1984-1989)	<ol style="list-style-type: none"> 1. Residential and business exchange line rentals 2. Local and national direct dialled call charges 	<ol style="list-style-type: none"> 1. Residential exchange line rental (maximum RPI+2) 	<ol style="list-style-type: none"> 1. Telephone Rental 2. International calls 3. Operator services including directory enquiries 4. Calls from public telephone boxes 5. Connection charges 	48%
RPI-4.5 (1989-1991)	<ol style="list-style-type: none"> 1. Residential and business exchange line rentals 2. Direct dialled local and national call charges 3. Operator assisted calls and directory enquiries service 	<ol style="list-style-type: none"> 1. Residential and business exchange line rentals (RPI+2) 2. Connection charges for new lines and charges for installations (RPI+2) 3. Private circuits (RPI+0) 4. Low user scheme up to 120 units per quarter (rentals limited to up to 60 per cent of normal rental) 5. Introduction of representative residential bill (informal control) 	<ol style="list-style-type: none"> 1. Telephone rental 2. International calls 3. Calls from public telephone boxes 4. Priority fault repair and new services 	54%
RPI-6.25 (1991-1993)	<ol style="list-style-type: none"> 1. Exchange line rentals 2. Local and national call charges 3. Operator assisted calls 4. International calls 	<ol style="list-style-type: none"> 1. Residential and single line rental (RPI+2); multi line rental (RPI+5) 2. Hard wired phone rental 3. Connection charges (RPI+2) 4. Private circuit banded (RPI) 5. Median residential bill (RPI) 6. Low user scheme (up to 120 units per quarter) 	<ol style="list-style-type: none"> 1. Telephone rental (although regulatory action led to a reduction in 1992-1993) 2. Public telephone boxes 3. Priority fault repair 	69%
RPI-7.5 (1993-1997)	<ol style="list-style-type: none"> 1. Exchange line rentals 2. Local and national call charges 3. Operator assisted calls 4. International calls 5. Connection charges 	<ol style="list-style-type: none"> 1. All exchange line rentals to (RPI+2) 2. Hard wired telephone rentals (RPI) 3. Maximum connection charge £99 + VAT 4. All individual prices in basket limited to RPI including connection charges 5. Extension of lower user scheme to 240 units 6. Private circuit basket (RPI) 	<ol style="list-style-type: none"> 1. Calls from public telephone boxes 2. Priority fault repair 	71%

In addition to side-constraints, additional services were brought into the basket. Only 48% of BT's revenue was under price caps in 1984, but 71% was capped by 1993 (including operator assisted calls and international calls). Burns (1993) maintains that the additions were because vigorous competition had not occurred in these markets, so the regulator wanted to limit the exercise of market power. Thus, prevention of undue price discrimination in various service markets seemed to require more complicated constraints. Core residential customers have been given special attention, with a low use scheme adopted as a mechanism for promoting universal service.

Encouragement of Efficiency

Is price cap regulation essentially rate of return regulation with a long (specified) lag? Weyman-Jones (1990) argues that "...where rates of technical innovation are highest, minimum efficient scale of a subset of product services is low, and comparative performance can be evaluated, the RPI-X framework becomes in effect a method for stimulating competitive pressures, and differs significantly from rate of return regulation." (p. 76) Price cap regulation in the UK has been associated with general price reductions for services (due to innovation and cost containment) and with relative price changes--so-called re-balancing. Attenborough, Foster, and Sandbach (1993) analyzed four services, exchange line rentals, and local, national and international calls. The basic rebalancing of local vs. long distance prices has been substantial, with the latter almost halving in real terms. Using reasonable estimates of demand elasticities, they show what prices would have been without rebalancing. They estimate the total welfare gain to be roughly two billion pounds per year in 1990/91 prices. About 70% of this improvement came from general price reductions (reflecting improvements in production efficiency, with 30% of the welfare gain arising from

movements towards Ramsey pricing). Taking into account an access externality effect, they estimate that an additional 20% welfare gain could be obtained by further movement towards Ramsey pricing (where equal weights are applied to the gains of all parties).

The fundamental characteristic of price caps is the decoupling of price from costs. While this technique violates conditions for allocative efficiency, rectangles are bigger than the triangles associated with the analysis! When prices are decoupled from a firm's own costs, the firm is rewarded for superior performance, and penalized for lackluster outcomes. Cost reductions translate into higher earnings for the firm, which is the source of the beneficial incentives. Clearly, generalized mechanisms (as opposed to targeted reward systems) provide firms with a broad-based incentive to control costs and to introduce new services. Another main benefit from price caps may come from flexibility--encouraging the incumbent to develop new rate designs that better reflect incremental costs. However, pure price caps have their own limitations. The practicalities of limited competitive pressure, politically powerful customer groups, and meeting other regulatory objectives has led to modifications in pure price caps.

Asymmetric regulation has characterized most jurisdictions where price caps have been utilized to promote efficiency. That is, incumbent firms have been constrained in a variety of ways to provide an opportunity for potential entrants to "test the water". As Table 2 (taken from Attenborough (1993)) indicates, Oftel's policies in the UK have assisted Mercury and other entrants in four ways: controlled rebalancing of prices--slowing the fall in long distance charges; low interconnection charges (which helped Mercury); permitting entrants freedom, while forcing BT to have uniform charges over all geographic areas;

Table 2
Entry Assistance and Regulatory Objectives
 (from Attenborough, 1993)

Assistance Measure	<i>Impact on</i>			
	Competition	Efficiency	Consumer Interests	Universal Service
Control of rebalancing	+long distance - local	- static* - allocative** +dynamic***	+residential - business	? short term - long term****
Low interconnection charge	+	- static - allocative +dynamic	? residential +business	- long term
Uniform charges and freedom to choose location	+urban - rural	- static - allocative +dynamic	- residential +business	- long term
Incumbent firm barred from certain areas	- short term +long term	- static ? dynamic	- short term +long term	?

- * Entry assistance involving price distortion or barring the incumbent from certain activities may lead to inefficient entry. In some case there may also be a loss of economies of scale. These are both examples of "static" inefficiency.
- ** Preventing prices moving closer to costs causes "allocative" inefficiency.
- *** Additional competition induces the incumbent to become more efficient and innovative over time ("dynamic" efficiency).
- **** If assistance persists for a long period and profitable traffic is lost, there is a risk that the incumbent's ability to finance universal service could be damaged.
- ***** This assumes that the measure is not permanent, The impact on dynamic efficiency is indeterminate as more long term competition increases efficiency, but barring the incumbent reduces innovation.

excluding BT from some markets, including transmission of entertainment services, facilitating cable entry into local telephony.

The static and allocative efficiency implications of such constraints are all negative. The expectation is that the dynamic gains from having multiple centers of initiative in the future will outweigh the short term inefficiencies. The "infant firm" justification for protection has its detractors--but policy-makers seem to view managed competition as a good response to a what could be characterized as a Problem of Second or even Third Best.

Neri and Bernard (1994) conclude that the difference between the U.S. and U.K. experience is in the competitive pressures faced by incumbent dominant firms. BT's pre-tax return on investment was roughly 20% from 1984-1993, so that increases in the productivity adjustment were in fact responses to high returns. Thus, the British experience resembles this aspect of ROR regulation. During the transitional period, competition complements price cap policy. Without competition, sharing rules emerge or tighter "X" adjustments are introduced over time.

2. Regulation, Competition, and the Burden of Proof

The fundamental tension between regulation and competition is widely recognized by economists. Reliance on the competitive marketplace to set prices and determine new service introductions is inconsistent with an agency setting prices for an incumbent. Continued command and control regulation creates opportunities for corporate gaming of the political system. When government intervention, rather than actual market performance, determines which firms are winners and which are losers, corporate executives have an incentive to devote resources to lawyers and consultants rather than to scientists and

engineers. Similarly, when regulators exercise substantial discretion (without clearly defined objectives articulated in the law), cohesive customer and supplier groups are encouraged to plead for special treatment. The hearing room rather than the industrial laboratory becomes the focus of attention. This tendency is most unfortunate (though nearly irresistible since such stakeholders have political power). Elected officials are tempted to continue to micromanage the industry.

Beneficiaries of Competition

The key issue facing legislators and regulators today is to design regulatory mechanisms which ensure that the benefits of competition flow to those who successfully commercialize new services and to consumers who desire those services. If government has a broad mandate to "regulate in the public interest," then the regulatory process becomes a relentless source of controversy. The term "public interest" is vague, leaving the prioritization of worthy economic and social objectives up to the chaotic political process. "Politics as usual" drives the evolution of the industry, at least until the configuration of firms (and artificial partitioning of markets) is so inefficient that stakeholders re-open the process. A number of regulatory jurisdictions are attempting to structure the rules of the game to increase reliance on basic market forces, recognizing that competition can be both chaotic and unpredictable.

Policy initiatives such as price caps should not wait until all uncertainties about their consequences are resolved. Technologies and demand patterns do not stand still. In telecommunications, industry performance will be affected by how regulators adapt to changes in basic conditions facing private decision-makers. We know that regulatory rules

from previous eras are unlikely to ensure that emerging industry structures will provide services at least cost. The real debate surrounds the types of transitional regulation suitable for this period of disruptive changes. Traditionally, U.S. regulators have served as buffers--delaying structural adjustments, but protecting some consumer groups and some suppliers from market dislocations. The operative term is *some*, since protectionism for some means that other customers and suppliers cannot take advantage of new commercial and technological opportunities.

Mistake Avoidance and Protectionism

The tendency towards traditional regulation and protectionism arises not only because the stakeholders who benefit from the status quo understand (and communicate) their interest. There is another factor: no one likes to make mistakes (outcomes that are regretted in retrospect). Yet, mistakes are inevitable in a world of uncertainty; for example, an investment might have a high payoff during a business expansion, but would be regretted in a downturn. Making what turns out to be a mistake (investing and then discovering that a downturn is occurring) is not a "bad" decision if the firm is not unduly risk averse and if the probabilities of failure were correctly calculated at the project analysis stage.

Each of us (analysts, regulators, politicians, and business executives) will try to camouflage our mistakes, making them difficult to detect.⁵ Since a clear and decisive act may turn out, in retrospect, to have unintended consequences (or be inconsistent with future economic developments), policy-makers will tend to avoid the explicit prioritization of

⁵A temporary loss of humility by one of the authors caused him to declare *Berg's Law*: "Given that mistakes will be made, decision-makers will try to make mistakes that are difficult to detect."

outcomes. Most decisions to change a policy have multiple impacts, so detection of a mistake is less likely if policy-makers can point to the outcome and identify its positive features as reflecting their intended objectives!

The elevation of the status quo is understandable, if misguided, for another reason. Maintaining the status quo is relatively safe. If the decision to continue current policies is incorrect, the costs are not readily visible. An example of placing different weights on sins of commission versus sins of omission is the FDA rejecting a beneficial drug. It is far more costly to the bureaucracy to accept (what turns out to be) a harmful drug than to reject a very beneficial one. The political penalties for the two types of errors differ. In the case of regulatory agencies, a greater burden of proof is required for a policy modification in the face of technological changes, making it more likely that the status quo will be maintained. For example, regulators might consider permitting greater downward price flexibility by an incumbent firm and allowing it to make some new service offerings. Since recent entrants will oppose such policies, regulators may delay a decision allowing greater flexibility until uncertainties are reduced. The costs of deciding to maintain the status quo are difficult to detect unless a firm's financial viability is threatened.

The shift towards price caps and incentive regulation in the late 1980s has a number of explanations. Developments in particular states or other nations increased the likelihood that errors of omission would be detected. State policies which reduce innovation and delay the introduction of valued services have been contrasted with other states' (or nations') policies which are more conducive to rapid technological advancement. In particular, regulators have asked how risk-taking investment activity can be encouraged for the creation

of telecommunications infrastructure and for the development of ancillary services. Thus, international and cross-state comparisons have begun to assume greater significance in the evaluation of policy alternatives. Regulators in many jurisdictions have concluded that adherence to the status quo via traditional regulation and protectionism is unlikely to encourage entrepreneurial activity by incumbent LECs.⁶ Technological developments have stimulated the ATT-McCaw partnership and cable TV company partnerships with competitive access providers (CAPs). These new strategic alliances will ultimately encroach onto LEC markets, regardless of state policies. The regulatory issue has become one of how to give the incumbent LECs the flexibility needed to respond to competition -- while ensuring that predatory activity does not occur and while protecting residential customers.

What happens if policy-makers reject a new policy initiative (such as price caps) when the change would represent an improvement over the status quo? Some policy-makers are more willing to tolerate these types of errors given their risk aversion and their concern that some negative outcomes might occur. For example, telecommunications regulators might hesitate to implement pure price caps which could boost corporate profits, thereby causing negative public reaction. But the end result for consumers also can be better telecommunications systems and easier access to new services. Often, policy-makers treat the policy choice as a zero-sum game instead of a win-win situation. Many industry analysts argue that taking a more comprehensive approach toward deregulation, despite the risk of

⁶Greenstein, McMaster, and Spiller (1994) present empirical tests which indicate that incentive regulation, and especially price caps, promote LEC network modernization.

mistakes, would lead to greater innovation. Consumers as a whole would be better off. Creative policy-making involves identifying these win-win policy options.

3. Evaluating the Impact of Price Cap Regulation⁷

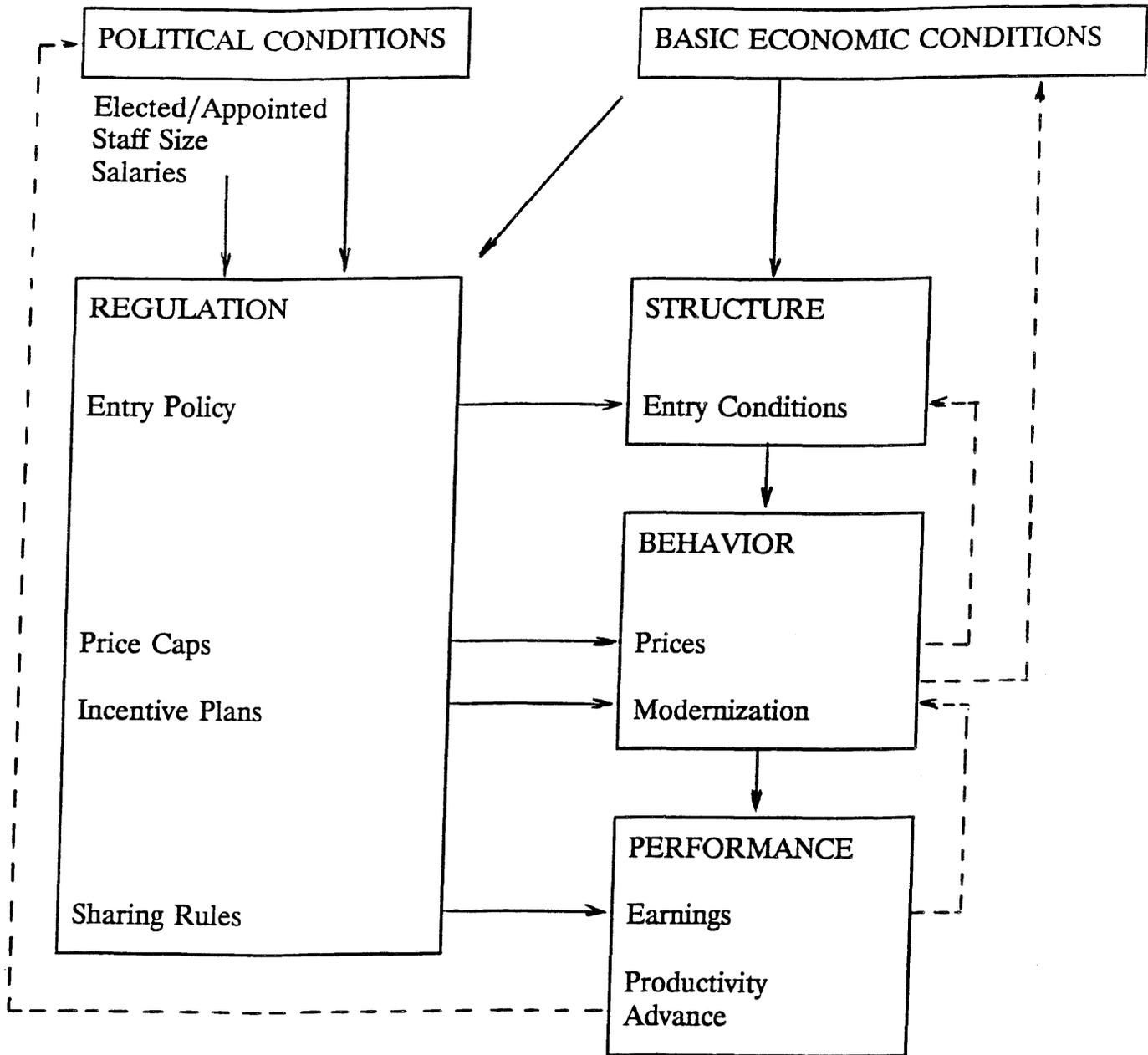
No one is able to predict with certainty the configuration of telecommunications firms and services that will best meet the future needs of individual states and the nation. Price caps represent a transitional mechanism which allows market processes greater influence in shaping corporate strategies. The question is, how promising are price cap mechanisms relative to the status quo or other forms of incentive regulation?

Because of the limited U.S. experience with price cap regulation in telecommunications, we are only beginning to see quantitative analysis of impacts. Cross-state models have not fully considered various types of incentive regulation, some of which would fit in the category of price cap plans. Determining the impacts of specific policies can be quite complicated since policies have been adopted at different times (and in different combinations) in response to political and economic pressures. Furthermore, it is not easy to develop proxies for state-by-state expectations regarding regulatory commitment and the likelihood (and direction) of rule modifications. Thus, the geographic and intertemporal patterns of regulations have stimulated much research -- but few definitive results.

Figure 1 provides an overview of causal relationships. Here, feedbacks are recognized. Basic economic conditions (technologies, preference structures, population density, income) determine the structure of the telecommunications industry--in conjunction with regulations. Four regulatory policies are identified: entry policy, price caps, incentive

⁷Part of this section is based on Berg and Foreman (1994).

Figure 1
Chains of Causation:
Regulation, Behavior, and Performance



(1) Performance = f (Regulation, Economic Conditions, Structure, Behavior)

(2) Behavior = g (Regulation, Economic Conditions, Structure)

(3) Regulation = h (Performance, Economic Conditions, Political Conditions)

plans, and sharing rules. These have been adopted in combination and separately in various state jurisdictions. Thus, economists have a natural experiment generating observations on regulatory regimes and (short term) corporate behavior and performance.

Characterizing the regulatory regimes and channels of causation is extremely difficult. For example, entry policies affect industry structure directly, but limits on incumbent price flexibility also encourage entry. Price caps have many components: productivity offsets, bundles of services, inflation adjustments, duration of the plan, quality of service constraints, and procedures (and the timing) for future modifications (Sappington, 1994). Similarly, incentive plans may establish a cap in exchange for network modernization investments (which, in turn, affect basic economic conditions and incentives for competitive entry). Sharing rules provide more incentives for cost containment and new service introductions than traditional rate of return regulation. Higher earnings provide a flow of funds which can be applied to modernization. Another potential feedback arises from productivity advances which affect political perceptions regarding the industry. Single equation models purporting to capture the causal factors behind regulatory innovations and the impacts of implementing particular rules need to be interpreted with care.

To illustrate the key relationships, let us posit three functions:

$$(1) \text{ Performance} = f(\text{Regulation, Economic Conditions, Structure, Behavior})$$

$$(2) \text{ Behavior} = g(\text{Regulation, Economic Conditions, Structure})$$

$$(3) \text{ Regulation} = h(\text{Performance, Economic Conditions, Political Conditions})$$

Some studies examine the determinants of dimensions of industry performance (equation (1)). For example, the deployment of digital infrastructure of introduction of new

technologies is explained in terms of regulation and other factors. Other studies show pricing decisions as a function of regulation (equation (2)). Some explain the use of new state regulations in terms of economic and political conditions (equation (3)).⁸ The main categories into which the studies fall are (1) technology and incentive regulation, (2) local, intraLATA toll, and access prices combined, (3) intrastate interLATA, and (4) intrastate, intraLATA. The literature is diverse in terms of the questions asked and the explanatory variables and methodologies employed. In general, incentive regulation appears to be linked with significant increases in technology deployment, but much work remains to be done to establish long term impacts. Measures of state demographic conditions and political environments appear to have significant impacts on regulatory regimes, policy selection, and service prices. In addition, the work on incentive regulation and technology deployment is in an early stage of development. The most detailed study of the linkage between incentive regulation and technology spans just four years. Most studies do not examine the linkage between existing price levels and dimensions of performance, so it is hard to determine whether states have benefitted from these policies.

We have some general concerns with the literature on intrastate telecommunications:

- Lack of underlying motivation for inclusion of some and omission of other variables,
- Endogeneity of explanatory variables with the dependent variable, and
- Need for analyses to incorporate intertemporal adjustments.

⁸Berg and Foreman (1994) provide a brief overview of the growing empirical literature on intrastate telecommunications.

Not all of the empirical analyses clearly define a working theory of how the regulatory process works. In fact, recent contributions on how to test competing theories of regulatory behavior suggest that distinguishing among different theories is often difficult in practice.⁹ Whether the regulator is postulated to maximize political voting support, a utility function, or social welfare, it seems safe to say that demand, cost structures, and some measures of the political or regulatory environment are germane. Variables are sometimes combined in an ad hoc manner that not only omits potentially important factors but often includes variables that are endogenous with the dependent variable.

Omission of variables and endogeneity are major concerns in studies of intrastate telecommunications. General categories of variables include (1) prices, (2) politics, (3) demographics, (3) regulation, and (4) industry/company features. For meaningful inferences about relationships among regulatory policy choices, technology deployment, and regulatory regime price impacts, one must control for underlying demographic features of states. Endogenous variables ought to be avoided unless a simultaneous equations approach is employed.

To summarize, we would like our policies to promote performance objectives-- particularly those with the highest priority. A database covering fifty states, over twenty years, including all policy components and performance dimensions might allow us to test a multi-equation model of the causes and effects of regulations. While empirical studies have provided us with a good foundation, much more work remains to be done. Thus,

⁹Nowell and Tschirhart (1993) present conditions necessary to distinguish between competing theories of regulatory behavior.

policy debates continue due to (a) disagreements regarding how the objectives ought to be weighted, or (b) differences in understanding regarding the links described in equations (1) - (3) above, or (c) alternative visions regarding how basic conditions are changing. Whatever the reasons, we find ourselves with different sets of prescriptions regarding what should be done.

We need a better understanding of the impacts of specific regulatory constraints and general oversight procedures so we can take advantage of the innovative capabilities of market processes. In addition, we must learn how to simultaneously constrain the exercise of market power and limit regulatory discretion--so that potential benefits from innovation and economies of scope are not dissipated through corporate gaming or political opportunism. Enhancing policy commitment capabilities reduces the likelihood that rules will be changed in ways that run counter to original regulatory agreements. Keeping commitments is important because it promotes efficiency and fairness during the period of transitional price-cap regulation.

4. Initial Prices Under Price-Cap Regulation: Costs of the Status Quo

Kwoka (1993) addresses many important policy concerns under price-cap regulation, while emphasizing cost changes over time. Other important issues include quality of service incentives, selection of the "X" adjustment, the appropriate adjustment for exogenous input price inflation, the inclusion of new substitute (or complementary) services, and the design of a menu of alternative plans. The discussion here is most concerned with initial conditions, strategic firm behavior, and adjustments over time as technologies and market structures change. Among the practical considerations for price-cap regulation, we focus on

the importance of the initial prices (or starting conditions) and the potential for strategic firm behavior under the constraint. We consider two primary types of price-cap regulation plans: (1) those where prices of services are capped individually, and (2) those where prices of multiple services as a group--i.e., a basket--are subject to a single cap. Examples of the first type are common at the state level in telecommunications regulation.¹⁰ The most prominent examples of price-cap regulation of baskets are the Federal plans used to regulate AT&T and British Telecom (BT).

A few points emerge from experience to date:

- The prices from an era of rate regulation almost certainly involve support mechanisms (e.g., universal service) that erode as technologies and market structures change.
- Since forgone opportunities are often unknown and the status quo politically acceptable, state regulators have chosen predominantly to cap individual service prices and largely anchor current price levels. With rapidly changing technologies and markets, some states are pursuing more aggressive policies; the magnitude of the opportunities (consumer savings and industrial growth) forgone by maintaining the status quo is becoming more apparent.
- In price-cap regulation of service baskets, strategic manipulation of the weighting scheme most commonly employed (relative revenues earned) only becomes possible under

¹⁰For example, in Michigan as in other states, services are categorized as local exchange, toll, or access. Price adjustments according to the Consumer Price Index (CPI) apply to local services.; access and toll service prices are capped at interstate and present levels, respectively (BellSouth 1993).

certain demand conditions. By monitoring price behavior, the regulator may gain insight into the demand elasticity for incumbent firms' services.

- "Current" prices that involve support mechanisms generally serve as the starting point for price-cap regulation. The two primary types of price-cap regulation plans employed at the state and Federal levels, on individual service prices and on average prices for groups (baskets) of services, perform quite differently. Individual caps may be inferior to service baskets when the initial prices are distorted, even when the firm acts strategically.
- Ultimately, the superiority of either separate caps or baskets reflects the "weights" regulators place in determining social welfare. If raising one class of prices is unacceptable politically, the predominance of separate caps or side constraints is understood.

When service prices are capped individually, the price tomorrow must not exceed that today, give or take adjustments for inflation less an offset for anticipated gains in productivity. This simple case theoretically approaches Vogelsang and Finsinger's (1979) original framework where the price converges to second-best outcome. Reality is more complex, and concerns for "fairness" and political viability also need to be taken into account.

Individual caps are excellent for maintaining the status quo, and the prices of some services may still fall. When services are capped individually, however, the firm is limited in its ability to undo cross-subsidies over time. In essence, the firm is over-constrained; this

is one justification for price-cap regulation of baskets. Rate bands and side constraints accentuate the problem by limiting the firm's price changes each year.

Any mechanism that maintains socially inefficient prices warrants attention. When market conditions change rapidly, the potential costs of capping prices individually are harder to evaluate since the effects tethering current price levels by capping prices individually ripple through decisions by incumbents and potential entrants. Decisions on new technologies and expansions of service offerings are affected by price cap rules. For example, prices above stand-alone cost attract inefficient entry absent barriers to entry. Similarly, prices yielding revenues below stand-alone cost do not allow the opportunity for efficient entry. Since the firm is the residual claimant of all profits earned at current price levels, price cap regulation is associated with more efficient incentives for cost reduction. One way to provide more degrees of freedom to the regulated firm is by creating service baskets. To satisfy the overall cap for a basket, the firm is able to raise some prices while lowering others. The simple example in the Technical Appendix demonstrates how eliminating a cross-subsidy can be in both the firm's and society's interests, and that the basket approach can provide modest consumer welfare and profit gains over separate caps.

Recent theoretical studies have demonstrated ways by which the firm can manipulate the price-cap constraint over time. (See Foreman (1994) and Sappington and Sibley (1992)). In the simple two-period example in the appendix, the firm manipulates the constraint by setting different prices on two comparable services. Increasing the price of one service today affects the share of total revenue earned by that service for the period. These revenue shares are the basis for weighing the contribution of service towards meeting the

cap in the AT&T and BT plans. Since the weights for this period depend on the revenue shares from last period, raising the price today on (formerly lower-priced) services can lead to greater profit.

As demonstrated in the example, however, consumers may still be better off when the firm acts strategically with a basket than with prices including cross-subsidies. A corollary, however, is that if the regulator places greater value on not having any higher prices, then the state's inclination towards separate caps makes sense. The opportunity costs are real, however, and some states will invariably pursue other options that reveal the spectrum of possible benefits.

Most price cap regulation plans distinguish between non-competitive, partially competitive, and fully competitive services, with each category receiving different regulatory treatment. Caps on individual, non-competitive service prices are seen as the most efficient regulatory form, and regulators can reassign services to different categories as apparent market conditions change. Many new services are apt to be complements or substitutes for present offerings, so the notion of "what the market will bear" for a competitive service may depend on the prevailing price in the regulated market. Demand interdependencies in a basket setting further complicate matters; this may be one more reason why Oftel has imposed additional constraints on BT over time.

5. Concluding Observations

The case for new regulatory initiatives is strong. Consider the concluding remarks by Strasser and Kohler (1989) in their study of incentive regulation:

Whatever the merits of specific plans, there can be no doubt that an approach using incentives is the direction to take. Traditional regulation is well established, fully fleshed out,

and thus comfortable for all parties to use. By contrast, a strategy of using incentives will be novel, imperfectly specified, and uncomfortably unfamiliar. The present approach is wrong with great precision. Wise regulatory policy must turn to incentive plans because they will be approximately right rather than precisely wrong. (p. 171)

To these words we can only add that the costs of regulation-as-usual tend to be hidden, and will not be revealed until new approaches, such as price caps, are given serious consideration by more state regulators.

The issues associated with price caps can be addressed in a systematic way or we can become fixated on eliminating all uncertainties. The ultimate price tag of the latter approach will be borne by citizens. One might wish that major suppliers, incumbents and entrants alike, had enough confidence in their own capabilities to desist from confrontation within the political process, moving towards competition in the economic marketplace. However, politics will continue to influence the evolution of the industries. It would be a mistake to leave the configuration of firms up solely to politics, considering the skewed incentives that excessive intervention introduces. With greater reliance on competition and increased use of price caps as a transitional mechanism, we will obtain more of the experimentation and innovation that markets are designed to promote.

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Technical Appendix

Price-Cap Constraint Formulas with Single and Multiple Baskets

Price-cap constraints consist of two main components: (1) a cap that specifies what prices are allowed, and (2) some measure of how actual, proposed prices count towards satisfying the constraint. The price-cap index (PCI) is based on (1) and (2); the measure of proposed prices is the actual price index (API). Using a subscript "t" to denote the period of time, the constraint requires simply that $API_t \leq PCI_t$, or that proposed prices not exceed the allowed level. The levels of the API and PCI for period t are those of last period adjusted for any changes in exogenous costs or inflation. Drawing upon the FCC's 1989 *Report and Order* and Mitchell and Vogelsang (1991), we present details of the formulas employed in the plan used to regulate AT&T. State price regulation plans that simply cap individual service prices may be viewed as forms of the service basket price-cap constraints described below.

Notation

Introducing some notation is necessary before presenting the price-cap formulas. Two periods are of interest, the current period (t) and the base period (t-1). PCI_t denotes the price cap or what is allowed for the current period. API_t represents a weighted average of the proposed percentage price changes. In the AT&T and BT plans, the weights are based on the base period share of revenues earned by each service; proposed prices (weighted using base period (t-1) quantities) must not exceed the current price-cap index. Let R represent the base period quantity of rate element i (Q_{t-1}^i) times its price when PCI_{t-1} was computed (p_{t-1}^i). Using "ACCESS_{t-1}" to represent base period access rates and dZ to

denote the dollar effect of current regulatory changes (compared to regulations in effect during the base period), the multiplier “w” captures the share of base period revenue for which changes are not due to changes in access rates:

$$w = [R - [\text{ACCESS}_{t-1} * Q_{t-1}] + Dz]/R \quad (1)$$

Additionally, let GNP-PI denote the Gross National Product Price Index, the general fixed-weight price index published by the US Department of Commerce’s Bureau of Economic Analysis.¹¹ Finally, X represents the productivity factor adjustment (or Consumer Productivity Dividend) and Dy dollar change associated with changes in access charges (change in charges multiplied by base period quantities). Using the Mitchell and Vogelsang notation, the AT&T actual and price-cap indexes are

$$\text{PCI}_t = \text{PCI}_{t-1} [1 + w(\text{GNP-PI} - X) + Dy/R + Dz/R], \text{ and} \quad (2)$$

$$\text{API}_t = \text{API}_{t-1} \sum_i v_i^i (p_t^i/p_{t-1}^i). \quad (3)$$

As described, the v_i are weights on each rate element i that are based on the base period revenue share of each element. Except for FCC-mandated Subscriber Line Charge (SLC) increases, AT&T price-caps are adjusted on an annual basis, and the cap changes become effective at the time the SLC changes become effective.

A Simple Example

The simple characterization of the AT&T plan that follows demonstrates under the AT&T constraint (that regulates percentage price changes for baskets of services) why

¹¹Under the FCC plan, the GNP-PI is included annually in the PCI on July 1. Percentage changes are calculated from fourth quarters of the current and preceding years.

service baskets may be preferable to separate price-caps when the initial prices under price-cap regulation involve cross-subsidies.

Suppose that there are two services with identical demands, A and B, over two time periods with no inflation, no discounting, zero fixed costs, and linear demand. Let Q_t^i represent the linear demand for service i in period t .¹² The firm incurs variable costs of production, c^i , that remain the same over time. Then profits for period t may be expressed as $\pi = \sum_{it} (p_t^i - c^i) Q_t^i$, for $i = A, B$, and $t = 1, 2$.¹³ The firm chooses the prices of services A and B to maximize profit subject to the constraint that its percentage price changes not exceed some level; for simplicity, suppose we normalize this level--the PCI--so that $PCI_t = PCI_{t-1} = 1$.

As a benchmark, first suppose that the initial prices on the two identical services were the same prior to price-cap regulation, so that $p_{t-1}^a = p_{t-1}^b = 0.30$. Since the initial weights (v_t^i) are based on the revenue share of each service from the preceding period, it is easy to see that the initial weights both equal 0.5 in this entirely symmetric case. It can be shown that the firm will maximize profit over two time periods by setting the prices of both services in each time period equal to the initial price of 0.3. For symmetric variable production costs of 0.05 and demands of $Q_t^i = (1 - P_t^i)$, profit, consumer surplus, and welfare in this case are $\pi = 0.7$, $cs = 0.98$, and $welfare = 1.68$.

¹²Without further loss of generality in the class of linear demand, demand may be written as $x_t^i = (1 - p_t^i)$. This implicitly assumes the firm has monopoly power. For a more general theoretical analysis of the potential for strategic behavior, see Foreman (1994).

¹³These assumptions are for convenience, to enable us to illustrate the different impacts of the two regimes.

Since the weights remain equal in each period, the firm in no way manipulates the weight structure for profit over time when the initial prices are symmetric. In this case, two separate caps, both equal to 0.3, will perform identically to the service basket.

The more interesting case arises where the initial prices on two otherwise identical services are not equivalent. Suppose that, absent cross-subsidization, both service prices would equal 0.3 as in the symmetric case. The numerical example offered Table 1 begins where existing prices are given by $p_{t-1}^a = 0.35$ and $p_{t-1}^b = 0.25$, so the initial revenue share weights placed in the basket on otherwise identical services differ, i.e., $w_t^a = 0.548$ and $w_t^b = 0.452$. With symmetric demands, $Q_t^i = (1 - p_t^i)$, and marginal costs, $c^i = 0.05$, for $i = A, B$, prices are chosen to maximize profit subject to the price-cap constraint jointly over both periods. For the single basket, a weighted average of the two prices must not exceed the level of the price-cap index (normalized to 1.0 in each period). Table A-1 presents the changes over time in welfare (consumer surplus and profit) for this simple case. Notice that with unequal initial weights, the firm earns the most profit by setting different prices on otherwise identical services. Over time, the firm and society's incentives overlap, and the firm moves to eliminate the cross-subsidy. In terms of magnitudes, profit and consumer surplus are 0.7% and 0.19% greater under the single price cap. When the units involved are billions of dollars, these gains can be substantial.

One fact worth noting is that if the regulator places a greater subjective weight on one or the other service, the welfare calculation may imply that separate caps perform

better for that set of objectives; it shall be explained, however, that these weights can entail large conformity costs.

Table A-1. Price-Cap Regulation with Symmetric Demands and Asymmetric Initial Prices

Setup. Existing Prices from Rate Regulation: $p_{t-1}^a = 0.35$ and $p_{t-1}^b = 0.25$. Marginal Costs: $c^a = 0.05$ and $c^b = 0.05$. Demand: $x_t^i = (1 - p_t^i)$, $i = A,B$, and $t = 1,2$.				
Constraint and Prices	Quantity (Q_t^i)	Profit (π)	Consumer Surplus (cs)	Social Welfare ($\pi + cs$)
Two Separate Price-Caps: $p_1^a = 0.35$ and $p_1^b = 0.25$ $p_2^a = 0.35$ and $p_2^b = 0.25$	$Q_t^a = 0.65$ $Q_t^b = 0.75$	$\pi = 0.69$	cs = 0.985	S = 1.675
Single Basket: Cost Escalation Index = 1.0 (normalized) Existing prices imply initial weights: $w_t^a = 0.548$ and $w_t^b = 0.452$. Profit-maximizing prices: $p_1^a = 0.319$ and $p_1^b = 0.277$ $p_2^a = 0.304$ and $p_2^b = 0.291$	$Q_1^a = 0.681$, $Q_1^b = 0.723$, $Q_2^a = 0.696$, $Q_2^b = 0.709$	$\pi = 0.695$	cs = 0.987	S = 1.682

Compared with two separate caps, a basket that contains both services produces

- Profit 0.71% higher,
- Consumer surplus 0.19% higher, and
- Social Welfare 0.40% higher.

It is clear that price-cap regulation that absolutely anchors prices, as in the separate cap case, is questionable whenever the initial prices are not optimal. Typically, regulatory commissions set rates based on current rates, which are almost certainly based on arbitrary cost allocations from an era of rate regulation; for example, some rates involve cross subsidies (as between urban and rural consumers). Even without competitive pressures, consumers might be better off paying very different prices for basic service, intraLATA toll calls, and access than those currently faced. Locking in current rates diminishes the well-known efficiency incentives of price-cap regulation. It appears that regulators acknowledge these potential costs but place greater weight on Bonbright's (1961) objectives of political acceptability and rate stability -- rather than allocative efficiency. Consumers are most vocal in the regulatory process when local rates increase. There are alternatives, however, such as offering the firm a well-designed menu of options, that can induce the firm to self-select prices that are in both its and consumers' interests.