

**QUALITY-OF-SERVICE AND MARKET IMPLICATIONS OF
ASYMMETRIC STANDARDS IN TELECOMMUNICATIONS**

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EXECUTIVE SUMMARY

With competition emerging as an increasing presence in the telecommunications industry, quality-of-service policies can continue to serve a valuable purpose. Quality-of-service has important efficiency and equity implications. In monopoly environments, the firm's profit-maximizing quality selection is often inconsistent with a social welfare optimum and can result in inferior price-quality choices for low-demand consumers. Binding price caps and rate freezes may encourage further quality distortions. Because the firm is the sole claimant to any cost savings, incentives exist for the firm to reduce expenditures and lower quality. Quality-of-service distortions are not limited to monopoly and price-regulated markets. Distortions can arise in competitive markets where the firm possesses more information regarding the product and its quality than consumers. Appropriately designed quality-of-service policies can help overcome these distortions. Sound quality-of-service policies can encourage or mandate quality levels consistent with social welfare improvement and equity goals.

Quality-of-service policies can be applied solely or more stringently to incumbent local exchange carriers (i.e., asymmetrical policies) or equally to all firms (i.e., symmetrical policies). Thirty state currently have symmetric quality-of-service standards. Each approach can have different implications for the telecommunications market structure. By applying more stringent standards to incumbents, state commissions can encourage competitive entry. Unequal standards create profit opportunities that encourage greater competitive entry. Alternatively, equal standards help promote efficiency. Profit opportunities will exist only for those competitors with efficient operations and desirable product and service offerings. This helps ensure industry costs are at a minimum and that social welfare increases.

This brief report draws two general policy recommendations. The first recommendation recognizes the advantages of minimum threshold symmetrical quality-of-service standards. A minimum threshold standard helps eliminate quality distortions that create inefficiency and inequity. With a minimum threshold, sufficient price-quality choice should remain for both consumers and firms while public safety and economic development are not compromised. The symmetrical application of standards will help ensure that industry costs are minimized and social welfare improved. Second, firms providing the underlying service should be responsible for meeting quality-of-service standards. Facilities-based carriers and resellers purchasing the incumbent's underlying service would not be responsible for quality on those elements. However, these competitors would be responsible for all aspects of quality for which they provide the underlying service. Tying provision of standards to the underlying service provision may reduce administrative and legal problems.

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FOREWORD

With competition emerging in the local telecommunications industry, many state commissions are examining the scope and application of quality-of-service policies in order to both promote competition and protect consumers. This NRRRI publication addresses this timely topic by reviewing and applying the economics literature to telecommunications quality-of-service, especially the symmetrical application of standards to incumbent local exchange carriers and their competitors.

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I. INTRODUCTION

With the imminent, and in some instances actual, emergence of competition in the telecommunications industry comes challenges to traditional state commission functions and responsibilities. State commissions, politicians, and researchers are redefining state commissions' roles in the new environment. One area of concern is quality-of-service policies. In a recent survey, The National Regulatory Research Institute (NRRI) found that some 45 states and the District of Columbia have some form of commission imposed or monitored quality-of-service standards.¹ Are these standards necessary in an emerging competitive environment? Many competitive markets do not have quality-of-service standards. This leads some to question the continuance of state commission standards. A further question concerns the applicability of these standards. Should the quality-of-service standards and potential penalties apply equally to all firms or should there exist different policies for incumbents and competitors? The state commission's response to this question will have important implications for the shape of future competition and economic welfare.

This brief report seeks to shed light on these important questions with an emphasis on regulatory symmetry, that is whether or not regulatory rules apply equally to all telecommunications providers. Unique features of the telecommunications industry can justify quality-of-service standards. These unique features include dominant firm provisioning and unequal knowledge between consumers and firms regarding service quality. Commission imposed or monitored standards can both safeguard consumers against quality degradation and discrimination and improve

¹ National Regulatory Research Institute, *Recent Developments in Telecommunications Service Quality Regulation* (Columbus, OH: National Regulatory Research Institute, 1998). The full results of the survey are available on the NRRI's Internet site at <http://www.nrri.ohio-state.edu> under State Surveys and Information.

aggregate economic welfare. Section Two briefly examines the theoretical quality-of-service literature and its applicability to the telecommunications industry. While standards can safeguard consumers and enhance aggregate economic welfare, how commissions impose these standards can influence entry and competition. We can view entry and competition as a two-stage game. In stage one, competitors make the decision to enter or not. In stage two, price and quality competition takes place. Mark Schankerman argues that asymmetric regulation influences the rules and outcomes in the second stage.² But, a potential entrant's assessment of the second stage outcome will influence its decision to enter or not. Thus, the state commission's decision on symmetric or asymmetric application of standards can influence competitive entry and short-to-medium term competition. Section Three examines the market implications of asymmetric standards. Some state commissions impose symmetric standards while others opt for more stringent standards for incumbents. Section Four discusses the results of the NRRI's quality-of-service survey as it relates to regulatory symmetry. The section also addresses unique difficulties posed by unbundled access and resale obligations that arise from the Telecommunications Act of 1996. Section Five provides some general policy recommendations and conclusions.

² Mark Schankerman, "Symmetric Regulation for Competitive Telecommunications," *Information Economics and Policy* (1996): 3-23.

II. QUALITY-OF-SERVICE AND THE NEED FOR STANDARDS

Before considering the market implications of asymmetric quality-of-service standards, we must first identify the merits of regulatory intervention. Regulators should impose quality-of-service policies only if they enhance efficiency or equity. If the current market structure induces distortions, regulation can improve efficiency by encouraging firm behavior consistent with social welfare maximization. Price caps and interconnection agreements are examples of two regulatory innovations that can improve efficiency. Regulation can also satisfy society's desires for a more equitable distribution of goods and services. Universal service programs are mechanisms to promote a more equitable distribution of telecommunications service. Without efficiency or equity concerns, the debate over asymmetric quality-of-service policies is moot as regulatory intervention is unnecessary. In the discussion that follows, we examine efficiency and equity concerns that arise relative to quality-of-service and that can serve to justify regulatory intervention.

Individuals possess heterogeneous preferences for goods and services. If we restrict our attention to the price-quality dimension, individuals have heterogeneous price-quality preferences for each good or service. Some consumers may prefer low-priced telephone service with a moderate delay in service repair time. In this case, quality is relatively less important than price for these consumers. Alternatively, some consumers may prefer high-priced telephone service with immediate service repair. In this case, quality is relatively more important than price for these consumers. Consumers maximize welfare when they purchase the price-quality dimension for each good or service that most closely matches their preferences. This is the basic premise of consumer maximization. In some instances, society constrains the available dimensions from which consumers can select. Merit goods are those that, due to imperfect knowledge or income and wealth inequity, individuals consume in too little

quantity.³ Society compels a minimum threshold level of consumption consistent with broadly held perceptions of the “correct” level of consumption (e.g., government mandates primary and secondary education). In telecommunications, some consumers may prefer or only be able to afford low-priced telephone service without 911 access. Society constrains the price-quality option by requiring 911 access as a merit good.

Competitive markets are generally the superior mechanism to satisfy individuals’ heterogeneous price-quality preferences. In competitive markets, firms compete on many dimensions, including price and quality. Firms will satisfy consumers’ price-quality preferences as long as the incremental revenues exceed the incremental costs. Firms with small repair staffs would offer consumers lower-priced telephone service with moderate service repair time delay if economic profits are available. Alternatively, a profit opportunity would induce firms to offer higher-priced telephone service with immediate service repair. In the long run, competition will force incremental revenues towards incremental costs and consumers will benefit by having the “best” (i.e., lowest price and highest quality) good or service consistent with their preferences. Consumers will be maximizing welfare in the competitive environment.

Competitive markets do not always satisfy individuals’ heterogeneous price-quality preferences. Problems arise when the firm knows more about the good or service’s quality than the consumer. This scenario is not unlike the telecommunications industry where the firms have a far better understanding of their product and its quality than most consumers. Akerlof shows how a competitive market with unequal quality information can degenerate into a market for only poor quality goods and services or no market at all.⁴ Since consumers do not know the quality of the good or service, they are willing to pay no more than the price of the average quality good or service. This induces firms with high quality to withhold offering their goods or services. The result is a downward cycle in price and quality. There are

³ John Head, “On Merit Goods,” *Finanzarchiv* (1966): 1-29.

⁴ George Akerlof, “The Market for ‘Lemons’: Quality Uncertainty and the Market Mechanism,” *Quarterly Journal of Economics* (1970): 488-500.

elements of the Akerlof and similar models that limit their applicability to the telecommunications industry. Specifically, these models do not consider warranties or governmental intervention (e.g., minimum quality standards). More significantly, these models do not allow for repeat purchases where consumers could observe quality and switch from firms not satisfying their price-quality preferences. However, these models do illustrate the complexity inherent in the concept of quality even in a competitive environment, much less an environment with remnants of market power.

If competitive markets can lead to quality distortions, monopolistic environments can also settle at inefficient or inequitable outcomes. The economics literature generally supports the proposition that monopolists will distort quality-of-service. There are two scenarios that illustrate this tendency. In the first scenario, the monopolist offers a single quality level selected from a range of quality. For example, the monopolist telephone firm would select a single repair service response time to offer—from a range of slow to fast options. Spence and Sheshinski both show that an unregulated monopolist will generally not optimally set quality.⁵ Rather, the monopolist could under or over supply quality. The specific outcome depends on the elasticity of demand and the deviation between average and marginal consumer value for quality. This first scenario points out the monopolist's efficiency distortion. In a second scenario, the firm can offer a range of quality. For example, the monopolist telephone firm would offer consumers a range of repair service response times from slow to fast. White and Mussa and Rosen show that an unregulated monopolist will undersupply quality for low-demand consumers.⁶ If the monopolist offers a lower price and moderate quality to low-demand consumers, high-demand consumers could substitute away from the more profitable high-priced services. The monopolist supplies

⁵ See A. Michael Spence, "Monopoly, Quality, and Regulation," *Bell Journal of Economics* (1975): 417-429 and Eytan Sheshinski, "Price, Quality, and Quantity Regulation in Monopoly Situations," *Economica* (1976): 127-137.

⁶ See Lawrence White, "Market Structure and Product Varieties," *American Economic Review* (1977): 179-182 and Michael Mussa and Sherwin Rosen, "Monopoly and Product Quality," *Journal of Economic Theory* (1978): 301-317.

low-demand consumers with a sufficiently poor price-quality combination in order to prevent high-demand consumers from switching. This second scenario illustrates an equity problem. Thus, the economics literature generally finds that a monopolistic environment will induce inefficient and inequitable outcomes.

With monopolistic and some competitive environments conducive to quality failures, we can consider the influence of regulatory intervention. The well-known Averch and Johnson Effect posits that firms subject to rate-of-return regulation may have incentive to overinvest in capital resources.⁷ Spence adapts the Averch and Johnson postulate to the quality-of-service debate.⁸ On capital dependent quality measures, rate-of-return regulation can provide a countervailing force to the monopolist's tendency to undersupply quality. For example, rate-of-return regulation could induce the local telephone monopolist to supply a level of transmission quality more consistent with social welfare maximization. However, the monopolist would likely under supply non-capital dependent (i.e., people dependent) quality. For example, the local telephone monopolist subject to rate-of-return regulation would be more likely to provide slower service repair time. Thus, rate-of-return regulation's influence on quality-of-service is somewhat ambiguous.

Moving into price regulation, the economics literature generally posits a degradation in quality-of-service. Quality degradation with a binding price restraint is not entirely unexpected. With cost a function of both quantity (y) and quality (q), we generally assume that cost (C) declines with lower quality (i.e., $\partial C(y,q)/\partial q > 0$). The quality degradation is not entirely harmless to the monopolist. We generally assume demand will decline with lower quality (i.e., $\partial P(y,q)/\partial q > 0$). However, the monopolist will generally earn higher economic profits by lowering quality-of-service under binding price restraints. Figure One provides a simple example of this tendency with linear

⁷ Harvey Averch and Leland Johnson, "Behavior of the Firm Under Regulatory Constraint," *American Economic Review* (1962): 1052-1069.

⁸ Spence.

demand and constant marginal cost. With a binding price restraint set equal to marginal cost

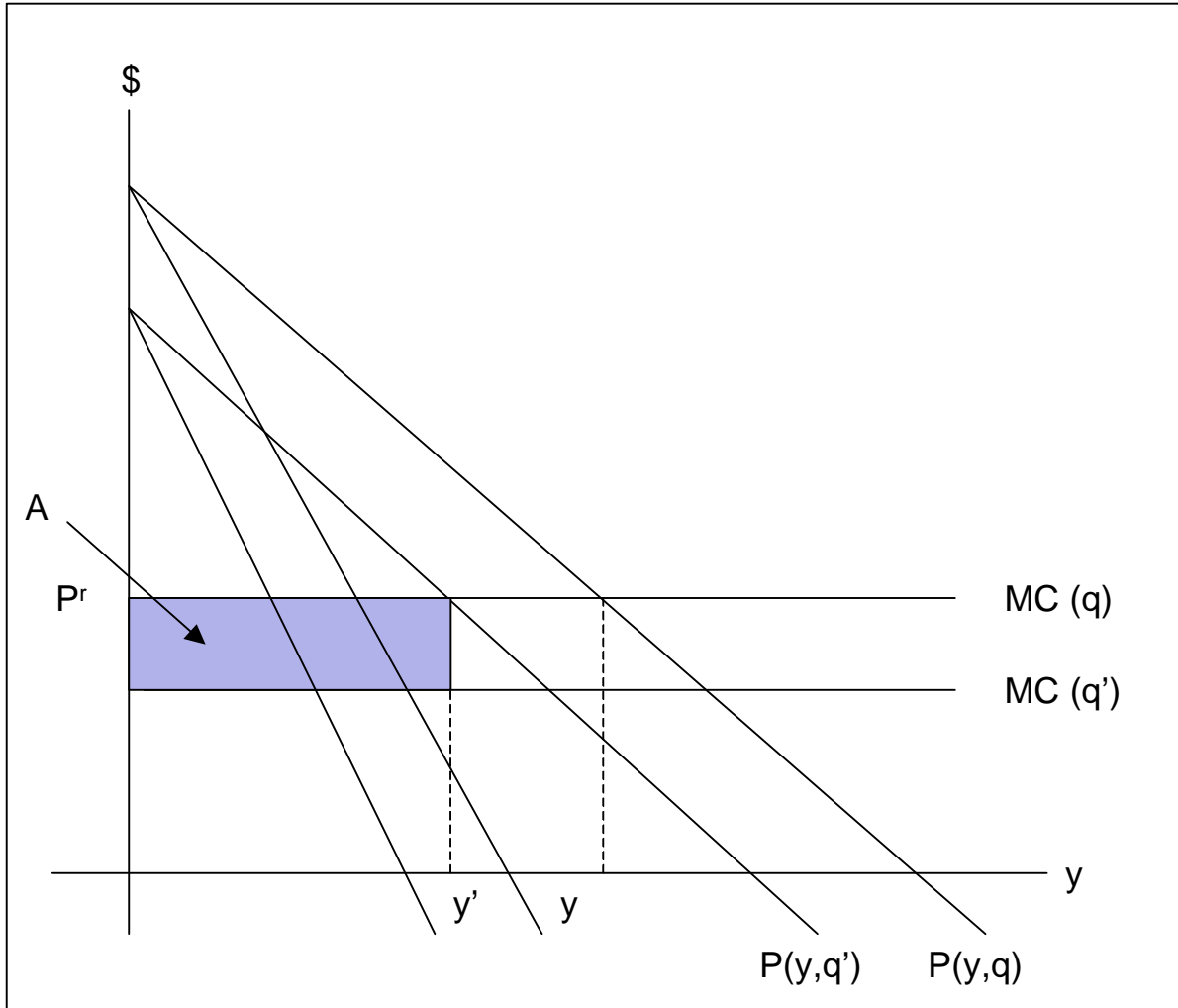


Figure 1: Incremental Profits From Binding Price Restraints and Quality-of-Service Degradation.

Source: Author's construct.

MC(q), the monopolist lowers quality-of-service. Marginal cost declines to MC(q') and demand shrinks to P(y,q'). Area A represents the incremental profits a price regulated firm can earn from lowering quality. This result holds as long as costs decline sufficiently and the reduction in demand is not excessive. Hazelett confirms this

conclusion with the experiences from the cable television industry.⁹ With maximum price restraints, cable television firms simply transferred services from regulated to unregulated baskets. Thus, the overall quality of price regulated services declined.¹⁰ Kihlstrom and Levhari and Baron resolve the foregoing problem by linking the maximum price restraint to the quality-of-service and its underlying costs.¹¹ By reestablishing the price-quality connection, the monopolist has less of an incentive to degrade quality-of-service.

Having shown how monopoly environments induce inefficient and potentially inequitable outcomes and that rate-of-return and price regulation induce further distortions, we turn to quality-of-service standards. Several authors identify outcomes favorable to economic welfare with minimum quality standards. Leland finds that minimum quality standards can enhance economic welfare in competitive environments with unequal information.¹² Economic welfare improves if demand is sensitive to quality, the elasticity of demand is low, the marginal cost of quality is low, and consumers place low value on poor quality. These necessary conditions are often found in the telecommunications industry. Besanko, Donnenfeld, and White find that

⁹ Thomas Hazelett, "Rate Regulation and the Quality of Cable Television," chapter 7 in *Quality and Reliability of Telecommunications Infrastructure*, ed. William Lehr (Mahwah, NJ: Lawrence Erlbaum Associates, 1995).

¹⁰ In a wide ranging empirical study of incentive regulation, Tardiff and Taylor find that a broad "scorecard" of quality-of-service is no worse under incentive regulation than under rate-of-return regulation. However, as we note above, rate-of-return regulation is not likely to be consistent with social welfare maximization. Thus, problems remain with maximum price restraints relative to quality-of-service even if they are not worse or certainly if worse than rate-of-return regulation. See Timothy Tardiff and William Taylor, *Telephone Company Performance Under Alternative Forms of Regulation in the U.S.* (Cambridge, MA: National Economic Research Associates, 1993).

¹¹ See Richard Kihlstrom and David Levhari, "Quality, Regulation, and Efficiency," *Kyklos* (1977): 214-234 and David Baron, "Price Regulation, Product Quality, and Asymmetric Information," *American Economic Review* (1981): 212-220.

¹² Hayne Leland, "Quacks, Lemons, and Licensing: A Theory of Minimum Quality Standards," *Journal of Political Economy* (1979): 1328-1346.

minimum quality standards can alleviate inequity problems.¹³ The minimum quality standards prevent the monopolist from excessively degrading the price-quality combinations it offers to low-demand consumers to prevent high-demand consumers' switching. Finally, Ronnen finds that appropriately set quality standards improve economic welfare.¹⁴ Economic welfare improves as all consumers receive higher quality goods and more consumption occurs.

In summary, the theoretical literature seems to indicate that minimum quality standards in both monopoly and some competitive environments are welfare enhancing and thus desirable. However, a crucial element concerns the regulator's ability to establish an appropriate quality-of-service program. The standards must be consistent with the price-quality preferences of consumers. If standards are too high or low, economic welfare would decline. Further, the important question of symmetry arises. Should the quality-of-service standards apply equally to all firms? The following section examines the economic welfare implications of asymmetric quality-of-service standards.

¹³ David Besanko, Shabtai Donnenfeld, and Lawrence White, "The Multiproduct Firm, Quality Choice, and Regulation," *Journal of Industrial Economics* (1988): 411-429.

¹⁴ Uri Ronnen, "Minimum Quality Standards, Fixed Costs, and Competition," *RAND Journal of Economics* (1991): 490-504.

III. ASYMMETRIC QUALITY-OF-SERVICE STANDARDS

With a clear basis for minimum quality-of-service standards in some instances, we move forward to consider symmetric versus asymmetric standards. Asymmetric regulation occurs when a single firm or group of firms are subject to differential government oversight. This oversight can include administrative procedures, standards, or requirements. The existing economics literature address asymmetric regulation in the telecommunications industry, especially that pertaining to asymmetric price regulation, carrier of last resort obligations, and reporting requirements. In this section, we extend the existing analysis to include the important issue of asymmetric quality-of-service standards. Should incumbent local exchange carriers be subject to more stringent standards than competitive local exchange carriers and resellers? As with most issues facing state commissions, there are both positive and negative aspects to asymmetric quality-of-service standards.

Positive Aspects of Asymmetric Quality-of-Service Standards

Stricter quality-of-service regulation for the incumbent can provide several important advantages to competitive local exchange carriers and resellers. First, the asymmetric standards may result in lower costs for the competitors compared to the incumbents. Assuming again that costs decline with lower quality (i.e., $\partial C(y,q)/\partial q > 0$), a firm subject to less demanding standards will incur lower costs. A competitor can offer slightly lower quality service and incur lower costs than an incumbent because it is not bound by the same strict standards. Additionally, the competitor incurs lower costs because it is not subject to the same monitoring and reporting requirements. Monitoring and reporting requirements raise the firm's costs without necessarily improving quality or stimulating additional demand. Further, the competitor may not be

subject to penalties. Penalties again raise the firm's costs without necessarily generating additional revenues. Overall, asymmetric standards can result in higher costs for the incumbent without the guarantee of offsetting revenues. This can allow the competitor to offer a slightly lower quality service with lower prices while remaining profitable. Second, the asymmetric standards can create a market niche for competitors that is not available to the incumbent. As we note previously, consumers generally have heterogeneous price-quality preferences. Some consumers may prefer lower-priced services with lower quality. If the incumbent's standards are above a minimum threshold, there will be price-quality combinations that the incumbent cannot serve even when demand is present. These consumer segments may be available for competitors to supply without the threat of competition from the incumbent. In essence, the asymmetric standards can shield firms in certain market segments from competition from the most potent challenger. Thus, asymmetric quality-of-service standards can provide important advantages for competitive local exchange carriers and resellers. They can result in cost advantages, some of which do not alter consumer demand, and protected market segments.

There are limits to the advantages that asymmetric quality-of-service standards can confer to competitive local exchange carriers and resellers. First, the reporting and monitoring requirements often represent a minor portion of the local exchange carrier's overall operating costs. These additional costs do provide a cost advantage to competitors not subject to standards. However, the magnitude of these cost advantages may prove insufficient to overcome other incumbent advantages and spur entry. Second, high quality service may prove important for most consumers. Consumers may generally reject lower quality service that competitors could offer even with lower prices. In this instance, preventing the incumbent from providing lower quality service through standards confers few benefits to competitors as minimal demand would exist for the services. Third, competitors may choose to provide superior quality service vis-a-vis the incumbent. The presence of asymmetric standards would offer few benefits beyond lower reporting and monitoring costs as the

competitor's quality would exceed the standards. Asymmetric standards generally do provide advantages to competitive local exchange carriers and resellers. However, the magnitude of these advantages is an unknown.

The advantages that asymmetric quality-of-service standards can confer to competitive local exchange carriers and resellers have implications for the industry structure and consumers. First, asymmetric standards will most likely encourage greater market entry. With some regulatory cost advantages and the possibility of protected market segments, competitors are more likely to encounter profitable opportunities. The existence of economic profits will induce market entry as entrepreneurs seek above average returns. Thus, asymmetric standards can result in more competitors than would exist with symmetric standards. These additional competitors can help jump start competition in the local telephone market. Consider the experience in the long distance market. From divestiture until 1987, AT&T earned over 80 percent of the long distance toll revenues.¹⁵ Most consumers initially stayed with the incumbent carrier. Similar experiences are presently occurring in the electric direct access market where incumbents' affiliated marketers often gain 80 percent of the market initially.¹⁶ By providing a mechanism that induces entry, asymmetric standards can help overcome the incumbent's initial advantages—advantages which typically arise from years of regulated monopoly franchise. Second, the asymmetric standards and greater entry will produce results more generally consistent with the conception of a competitive market. As competitive local exchange carriers and resellers enter the market, competition will push price towards marginal cost. This will improve allocative efficiency as price falls towards cost and output expands. Further, competition will induce firms to meet all consumer price-quality combinations where incremental revenues exceed incremental costs. Economic profits encourage firms to

¹⁵ James Zolnierek, Katie Rangos, and James Eisner, *Long Distance Market Shares: First Quarter 1998* (Washington, DC: Federal Communications Commission, 1998): Table 3.5.

¹⁶ Commissioner P. Gregory Conlon, *Dissenting Opinion to Opinion Adopting Standards of Conduct Governing Relationships Between Utilities and Their Affiliates*, Docket 97-12-088 (San Francisco, CA: California Public Utilities Commission, 16 December 1997), 2-3.

respond to heterogeneous consumer demand. Thus, more consumers will have their preference met. By providing a relative advantage to competitive local exchange carriers and resellers, asymmetric quality-of-service standards can induce greater market entry and competition that could benefit consumers.

These positive aspects of asymmetric quality-of-service standards are consistent with a variant of the infant industry strategy. The infant industry strategy is used in international trade to provide protection from imports or support for exports for new firms. Infant industry protection is generally employed in developing countries to stimulate manufacturing. In developed countries, infant industry protection and support is justified for strategic industries (e.g., semiconductors, commercial aircraft).¹⁷ Why are the protections and support, as well as asymmetric quality-of-service standards, important for a competitive environment? Corden identifies economies of time as a potential justification for support to new firms.¹⁸ This is simply the familiar learning-by-doing phenomena. Firms gain a cost advantage because they begin operations earlier than their competitors. The additional operating time permits the firm to acquire skills and experiences that new firms do not possess. In a competitive environment, the learning-by-doing is simply a cost of entering the market and does not generally justify intervention. However, some conditions can justify efforts to overcome the learning-by-doing advantage. Corden identifies imperfections in private information and capital markets.¹⁹ These are the same conditions that appear in the local telephone industry. Consumers often lack adequate information about competitive local exchange carriers and resellers. Additionally, smaller firms could encounter difficulty securing financing for the initial foray into the local telephone industry. Finally, the advantages the

¹⁷ Laura D'Andrea Tyson, *Who's Bashing Whom? Trade Conflict in High Technology Industries* (Washington, DC: Institute for International Economics, 1992).

¹⁸ W. Max Corden, "The Infant Industry Argument," chapter 8 in *Trade Policy and Economic Welfare* (Oxford, England: Clarendon Press, 1997).

¹⁹ *Ibid.*

incumbent possesses from learning-by-doing are the result of its previous regulated monopoly franchise.

Asymmetric quality-of-service standards can confer benefits to certain segments of the local telephone industry. The asymmetric standards may provide competitive local exchange carriers and resellers with lower costs and protected market segments. These advantages can help the competitors overcome the learning-by-doing and name recognition advantages the incumbent possesses. Further, these advantages will encourage greater market entry. This entry should stimulate competition that pushes price closer towards cost and that meets more consumers' price-quality preferences. However, asymmetric standards are not without their own problems. In the next section, we examine the distortions that asymmetric standards can induce and the ramifications.

Negative Aspects of Asymmetric Quality-of-Service Standards

As with many issues facing state commissions, the principal positive aspect of asymmetric quality-of-service standards (i.e., stimulating competitive entry) can also be its principal negative aspect. Artificially encouraging competitive entry can create production inefficiency with resulting higher aggregate industry costs. There are also other disadvantages with asymmetric standards. Asymmetric standards can create dynamic inefficiency. Additionally, consumers could encounter equity problems.

Efficiency is a central component to any economic discussion, including asymmetric quality-of-service standards. The main categories of efficiency are allocative, production, and dynamic efficiencies. Allocative efficiency occurs when price equals marginal cost. This occurs when the price consumers are willing to pay for a given level of telephone quality (i.e., the value consumers assign to the service and its quality) equals the social cost of providing the telephone service at the given quality level. Social resources are dedicated to their most valued purpose. Production efficiency occurs when firms are minimizing costs and aggregate industry costs are

minimized. The total industry cost of supplying telephone service at each quality level is as low as technologically feasible. In general, production efficiency gains exceed allocative efficiency gains. This occurs because allocative efficiency affects marginal units while production efficiency affects all units. Dynamic efficiency occurs when firms develop new processes that create new products and services and lower costs. For example, digital technology is a dynamic improvement over electromechanical technology. Competitive markets encourage allocative, production, and dynamic efficiency. The profit motive induces firms to seek out cost-minimizing technology and new products and services while competition forces price towards marginal cost. Rate-of-return regulation encourages allocative efficiency. Regulators seek to push price as close to marginal cost as possible while maintaining the firm's financial viability. However, rate-of-return regulation can induce production inefficiency. Price cap and other alternative regulatory regimes seek to promote production efficiency. Since the price-cap regulated firm becomes a residual claimant to incremental earnings, it has an incentive to minimize costs and develop new products and services. Asymmetric standards influence allocative, production, and dynamic efficiency.

As the previous section notes, asymmetric quality-of-service standards can induce allocative efficiency in the local telephone market for lower quality services. The asymmetric standards can create an economic profit opportunity for competitive local exchange carriers and resellers. These firms will enjoy a cost advantage and protection from incumbent competition in the market for low-priced—low-quality service. The presence of economic profits will induce competitive entry. The entry and subsequent competition will force price towards cost without the need for regulatory intervention. Thus, asymmetric standards can help promote allocative efficiency in the low-priced—low-quality segment of the local telephone market.

At the same time, asymmetric quality-of-service standards can create production inefficiency. Asymmetric regulation, whether through prices, carrier of last resort obligations, or quality-of-service standards, creates a bias in favor of certain firms, or classes of firms, and technologies. These biases distort market signals. In a

market environment free of regulatory intervention, prices and economic profits provide signals to consumers and firms. The price results from the interaction of consumers' willingness to pay, underlying resource costs and technology, and market power. If economic profits are present, firms will enter the market to appropriate some or all the surplus for themselves. The economic profits arise from natural market forces representing consumers' preferences and firms' technology. With asymmetric standards, regulation can create artificial profit signals. Economic profits do not necessarily exist because the firm is the least-cost provider or offers a unique product. Rather, economic profits could arise because asymmetric standards artificially increase one firm's costs or create protected markets. Natural market forces representing consumers' preferences and firms' technology are no longer the sole market signal.

How do these distorted signals create production inefficiency? Production inefficiency occurs when aggregate industry costs are not minimized. Asymmetric quality-of-service standards create artificial profit signals. A range of profitable price-quality combinations can exist that would not be present without the incumbent's additional costs or blocked entry due to asymmetric standards. Thus, firms with costs greater than the incumbent could enter the market, make investments, and earn economic profits. However, these entrants and investments are not necessarily industry cost minimizing. The net result could be higher aggregate industry costs that reduce economic welfare.

A stylized example will help illustrate a potential production inefficiency and lower economic welfare. Consider a market with two firms, an incumbent and entrant, and two discrete quality levels, high quality and low quality. The incumbent is the cost minimizing provider for both quality levels. Table One presents the relevant facts. If the incumbent is subject to quality-of-service standards that preclude it from offering low quality service, the relevant industry costs will be \$16.00 for high quality and \$12.50 for low quality. Average industry costs are then \$14.25 if consumers divide their purchases evenly between high and low quality service. With symmetric standards set at the low quality level, the incumbent will supply both the high and low

quality service. The average industry cost is now \$13.00. Thus, the asymmetric standard increases average industry costs. This is a production inefficiency that reduces aggregate economic welfare.

TABLE 1			
Firm and Industry Costs With and Without Asymmetric Standards (Assumes Consumers Split Purchases Evenly Between High and Low)			
	High Quality Service	Low Quality Service	Industry Average
Incumbent	\$16.00	\$10.00	
Entrant	\$20.00	\$12.50	
Industry Costs With Asymmetric Standards	\$16.00	\$12.50	\$14.25
Industry Costs Without Asymmetric Standards	\$16.00	\$10.00	\$13.00

There are two factors that could offset these results. First, the entrant could be the cost minimizer in one or both markets. The entrant will supply one or both of the markets with no production inefficiency. In this instance, the asymmetric standards that preclude the incumbent's participation in the low quality market are not relevant. Asymmetric quality-of-service standards would only be relevant to the extent that they artificially raise the incumbent's costs vis-a-vis the entrant's costs. Second, the presence of the entrant could help keep the incumbent's price closer to its underlying cost. An incumbent lacking any competitors has an incentive to withhold quantity and raise price. This could result in lower economic welfare. However, free entry and exit without asymmetric standards can bring about the same results. Further, most state commissions maintain price regulation on incumbents designed to keep price near cost. Thus, asymmetric standards will not always bring about production inefficiency and lower economic welfare. However, they certainly create an environment where distortions may occur.

In this view, inducing the entry of many firms is not necessarily consistent with maximizing aggregate economic welfare. Haring and Weisman introduce and describe three types of regulation that illustrate this point well.²⁰ “Competitor necessity” regulation focuses on the competitors’ welfare. The regulation seeks to protect and promote competitors. “Competition necessity” regulation permits the incumbent to respond to an entrant’s price or strategic action, but not to initiate action. These are two forms of asymmetric regulation which the authors discuss in the context of price and carrier of last resort obligations. “Consumer necessity” regulation focuses on enhancing consumers’ welfare, not competitors’ welfare. The authors believe this regulation, a form of symmetric regulation, will maximize economic welfare because consumers’ preferences will be met and industry costs will be minimized. As noted above, asymmetric quality-of-service standards can create distortions that inhibit these favorable outcomes.

Asymmetric quality-of-service standards can also hamper dynamic efficiency. Dynamic efficiency occurs when firms develop new processes that create new products and services and lower costs. Excluding the incumbent from certain market segments through asymmetric quality-of-service standards limits product and service competition in these segments. The product and service competition results in quantum changes in products, services, and technologies that enhance economic welfare. Firms compete through products and services because it offers opportunities for larger economic profits than price competition. By eliminating a significant competitor in certain market segments, asymmetric standards can reduce the level of product and service competition that leads to dynamic efficiency. Further, asymmetric standards limit the synergies possible when firms operate in several segments of the market.

Up to this point, the disadvantages of asymmetric quality-of-service standards have been production and firm related. Are there any disadvantages that directly influence consumers? Problems can arise from consumers’ limited information. First,

²⁰ See, John Haring and Dennis Weisman, “Dominance, Non-Dominance, and the Public Interest in Telecommunications Regulation,” *Telecommunications Policy* (1993): 98-106.

consumers are unlikely to fully account for the different standards applying to incumbents and entrants. Product and quality standards generally apply equally to all firms. Consumers may not fully consider that there are differing standards. This is more likely in the local telephone industry as consumers have traditionally purchased services from a regulated monopoly for which service quality has been explicitly or implicitly monitored by the state commission. Second, consumers are vulnerable to misinformation and possible deception. In the telecommunications industry, firms possess far greater knowledge of their product quality than consumers. Lacking complete information, consumers are vulnerable to purchasing inadequate services. This is especially true if some firms are not subject to standards similar to their competitors. This situation creates an environment where consumers are more likely to purchase local telephone services that do not meet their price-quality preferences and maximize their welfare.

The preceding discussion paints a bleak picture of asymmetric quality-of-service standards. Asymmetric standards can create production and dynamic inefficiencies. These inefficiencies reduce aggregate economic welfare. Additionally, asymmetric standards, when accompanied by unequal information between consumers and the firm, can create direct consumer problems. State commissions must consider those factors that are most important in their local telephone markets relative to the positive and negative aspects of asymmetric standards when deciding upon quality-of-service policies. The next section examines the quality-of-service policies in the fifty states and the District of Columbia.

IV. RESULTS FROM THE NRRI'S QUALITY-OF-SERVICE SURVEY

In late 1997 and early 1998, the NRRI conducted a survey to gauge current state commission quality-of-service policies. The survey was a follow up to a 1995 survey that culminated in the report *Telecommunications Service Quality*.²¹ In the latest survey, the NRRI contacted all fifty states and the District of Columbia. The survey focused on end-user quality-of-service. State commissions were queried on five specific issues. These issues included current quality-of-service standards, proceedings since the 1995 survey, regulatory symmetry in quality-of-service, the presence of a consumer "Bill of Rights," and the relationship between alternative regulatory policies and quality-of-service standards.

With technology and market conditions evolving rapidly, state commissions are responding with quality-of-service initiatives. State commissions are increasingly encouraging and responding to emerging competition with a range of regulatory policies, such as earnings sharing, price caps, and deregulation. At the same time, state commissions seek to protect end-users with quality-of-service standards and at times penalties. Forty-three states said they had quality-of-service standards. This is a ten state increase from the National Association of Regulatory Utility Commissioners' 1992 finding.²² Additionally, four states (Arizona, Minnesota, Mississippi, and New Mexico) have initiated quality-of-service standards since the NRRI's 1995 survey. Another twenty states have revised their existing quality-of-service standards since the NRRI's 1995 survey. There is an unmistakable trend towards greater quality-of-service

²¹ Vivian Witkind Davis et. al, *Telecommunications Service Quality* (Columbus, OH: The National Regulatory Research Institute, 1996). The report provides extensive coverage of the quality-of-service problem, state commission initiatives, economic issues, and the design of quality-of-service policies.

²² Staff Subcommittee of Telephone Service Quality, *Telephone Service Quality Handbook* (Washington, DC: National Association of Regulatory Utility Commissioners, 1992), Appendix H.

attention by state commissions as the telecommunications industry transformation continues unabated. The general deregulatory and procompetitive Telecommunications Act of 1996 permits active state involvement in quality-of-service. Specifically, “nothing...shall affect the ability of a State to impose, on a competitively neutral basis...requirements necessary to...ensure the continued quality of telecommunications services, and safeguard the rights of consumers.”²³ State commissions are free to initiate, maintain, and strengthen their quality-of-service standards to protect end user consumers. However, these policies must be competitively neutral. Competitive neutrality ties closely to this paper’s central discussion of regulatory symmetry.

Table Two presents the regulatory symmetry results of the NRRI’s recent survey. There is a divergence among state commissions’ positions on the symmetry of quality-of-service standards. Additionally, the symmetry issue remains unsettled in several states. Seven state commissions remain undecided regarding the symmetrical application of their quality-of-service standards. For example, Massachusetts and Rhode Island are waiting until competition is imminent or occurring before venturing into the symmetry debate. The remainder of this section will examine those states with symmetric and asymmetric quality-of-service standards and the unique obstacles resale and unbundling pose.

States with Symmetric Quality-of-Service Standards

Thirty states currently impose symmetric quality-of-service standards. In these states, the same standards and penalties, where applicable, generally apply equally to incumbent local exchange carriers and competitors. All firms face the same requirements; there are not lesser requirements to promote entry by competitors. In

²³ 47 U.S.C. § 253(b).

Arkansas, the commission's *Telecommunications Providers Rules* state that "each LEC shall ensure that adequate facilities are available to meet the requirements in these

TABLE 2
SYMMETRY OF QUALITY-OF-SERVICE POLICIES
(as of May 1998)

State	Symmetry	Status and Comments on Symmetry
Alabama	No	Rules require ILECs under price caps to meet tougher standards than CLECs.
Alaska	Yes	But the Commission is looking at how to differentiate between resellers and facilities-based carriers.
Arizona	No	Standards apply to US West and CLECs with a certificate to provide service, but penalties apply only to US West.
Arkansas	Yes	
California	Yes	
Colorado	I.N.A.	
Connecticut	No	The QOS standards apply just to SNET.
Delaware	Yes	
District of Columbia	Yes	But no test of this because Bell Atlantic is the only LEC operating.
Florida	No	The rules apply to ILECs only, but CLEC levels of service are compared to published levels in the price list.
Georgia	Yes	
Hawaii	No	Most standards apply to EXR receiving USF (State and Federal) and proving non-competitive services.
Idaho	Yes	Rules apply to any provider of basic local exchange service (residential or businesses with 5 or fewer lines).
Illinois	Yes	
Indiana	Yes	
Iowa	Yes	All local exchange carriers, both ILECs and CLECs, must meet the same standards for services on their own facilities (i.e., CLECs are not responsible for resale elements).
Kansas	Yes	
Kentucky	Yes	
Louisiana	Yes	
Maine	Not decided	This is being debated; looking at discrimination between ETCs and others.
Maryland	Yes	
Massachusetts	No	A determination will be made when competition is imminent or occurs.
Michigan	Yes	
Minnesota	Not decided	A proceeding began early in 1998.
Mississippi	Not decided	Commission is considering extending ILEC standards to CLECs.
Missouri	Yes	
Montana	Yes	

TABLE 2 (Continued)
SYMMETRY OF QUALITY-OF-SERVICE POLICIES
(as of May 1998)

State	Symmetry	Status and Comments on Symmetry
Nebraska	Yes	
Nevada	No	Alternative regulation on ILECs under formal QOS standards only.
New Hampshire	No	Standards apply only to Bell Atlantic. However, all LECs must report.
New Jersey	No	The 1978 rules apply to all LECs, the 1987 standards apply only to Bell Atlantic.
New Mexico	Yes	
New York	Yes	
North Carolina	Yes	
North Dakota	N/A	
Ohio	Yes and no	On local level, companies are treated the same; the Commission did write some rules to deal with differences between CLECs.
Oklahoma	Yes	
Oregon	Yes	
Pennsylvania	Not decided	The Commission decided standards were applicable to all companies and a court overturned the decision. Currently, in legal proceedings with 11 active cases.
Rhode Island	No	State has only one LEC with CLECs now entering. No standards established for CLECs.
South Carolina	Yes	Standards for ILECs and CLECs are the same.
South Dakota	No	Yes, all companies must meet the Federal universal service standards.
Tennessee	Yes	
Texas	No	The rules apply to dominant carrier only (ILEC). The CLECs must agree to meet benchmarks covered in certificate process.
Utah	Not decided	The Division of Public Utilities wants standards to apply to companies.
Vermont	Yes	
Virginia	Yes	Standards apply to all ILECs and CLECs.
Washington	Yes	
West Virginia	No	CLECs and ILECs more closely regulated than IXCs. Wireless carriers have least regulation.
Wisconsin	Yes	Proposed rules.
Wyoming	No	There is concern about treating resellers the same as ILECs, but no action has been taken.

I.N.A.: Information Not Available.

SOURCE: 1997 and 1998 NRRI Survey of State Regulatory Commissions.

rules.”²⁴ Each carrier must satisfy the commission’s standards for repair service answering time, traffic capability, call completion, and transmission standards, among others. In Virginia, “each local exchange telephone company shall provide the necessary equipment, plant facilities, and personnel within its certified area(s) to deliver high quality customer service.”²⁵ The commission will measure each local exchange telephone company’s performance on eight service indicators including complaints per 1,000 lines, trouble and repeat trouble reports, and service orders completed within five working days. Arkansas and Virginia provide examples of the types of symmetric quality-of-service standards that thirty states use. All firms must equally satisfy the commission’s standards. This is the essence of regulatory symmetry.

Simply because a state commission currently imposes symmetric quality-of-service standards does not preclude it from considering other alternatives. In California, the Public Utilities Commission is initiating a review of its current quality-of-service policies.²⁶ General Order 133-B, which specifies a series of technical quality parameters, is currently applicable to all telephone utilities providing service in the state. In the current docket, the commission asks whether service quality standards should apply to all telephone carriers. One possibility involves creating two service quality standards—one standard for dominant carriers and another standard for non-dominant carriers. Thus, the symmetry debate is not closed even in those states that currently impose symmetric quality-of-service standards.

²⁴ Arkansas Public Service Commission, *Telecommunications Providers Rules*, Docket 97-040-R (Little Rock, AR: Arkansas Public Service Commission, 1997).

²⁵ 20 Virginia Administrative Code 5-400-80.

²⁶ California Public Utilities Commission, *Order Instituting Rulemaking on the Commission’s Own Motion into the Service Quality Standards for All Telecommunications Carriers and Revisions to General Order 133-B*, Docket 98-06-029 (San Francisco, CA: California Public Utilities Commission, 1998).

States with Asymmetric Quality-of-Service Standards

Fifteen state commissions utilize different quality-of-service policies depending on the circumstances and the firms involved. Some state commissions impose tighter standards and penalties with alternative regulatory regimes. In Alabama, the commission's rules require incumbent local exchange carriers under price cap regulation to meet more stringent standards than competitive local exchange carriers. BellSouth's price cap plan stipulates that the firm's performance on the service quality standards will influence the productivity offset. In these states, a tradeoff between greater pricing freedom and enhanced quality-of-service standards is apparent. The firm receives greater pricing flexibility to respond to emerging competition while consumers receive a degree of protection against potential quality degradation. In several states, the commission's standards apply to incumbent local exchange carriers while the commission monitors and reports on competitive local exchange carrier performance. This is the policy in Florida and Texas. The commission's quality-of-service standards apply to the incumbent local exchange carriers while competitive local exchange carriers need only meet the benchmarks set forth in their price lists or certificates. Finally, in Arizona quality-of-service standards apply equally to U S West and competitors. However, the commission will impose fines only on U S West. The asymmetric policies of these fifteen states create different market incentives than symmetric policies and serve each state's unique needs.

Complications Arising from Resale and Unbundling

The Telecommunications Act of 1996 interjects new complications into quality-of-service and symmetric regulation. Section 251 obligations require incumbent local exchange carriers to provide unbundled access to network elements and resale of telecommunications services. In these instances, the competitors simply purchase access to elements and services at reduced rates and either integrate them into their

existing network or resell them in their current form. The competitors have no control over the underlying service or its quality.

State commissions must decide how they will handle quality-of-service standards and penalties when the incumbent local exchange carrier provides the underlying service. One option involves holding the unbundled access purchasers and resellers responsible for all aspects of service. The competitors must satisfy all quality-of-service standards, including those for which the incumbent local exchange carrier provides the underlying service. In this option, the competitors must seek redress from the incumbent local exchange carrier for both lost revenues and any applicable commission sanctions or penalties. Section 251 provisions on nondiscriminatory conditions and limitations could provide an avenue for relief. A second option involves excusing the competitors from quality-of-service standards and penalties applicable to unbundled access and resale services. The competitors are responsible only for those aspects of service for which they provide the underlying service. The incumbent local exchange carrier providing the underlying services is responsible for the unbundled access and resale services. Iowa is the only state to mention this difference during the recent NRRRI survey. In Iowa, competitors are responsible for meeting the same standards as incumbents for services the competitor provides on its own network. Thus, Iowa applies quality-of-service symmetry on underlying services.

The NRRRI survey illustrates the practical difficulty in implementing quality-of-service standards in an emerging competitive environment. A majority of state commissions adopt regulatory symmetry, whereby incumbents and competitors face the same regulatory mandates. This helps promote efficient entry and investment and protects consumers regardless of their telecommunications provider. Alternatively, many state commissions adopt asymmetric regulation. Competitors encounter lower regulatory mandates than incumbents. This helps stimulate early entry and competition. Finally, several states continue to study and debate regulatory symmetry. The addition of unbundled access and resale services further complicates the job of implementing quality-of-service policies in an emerging competitive environment.

V. CONCLUSION

Quality-of-service standards and their symmetric or asymmetric application is a difficult policy issue. As we have seen, standards are appropriate in some instances. The dominant firm provisioning and unequal information conditions present in the telecommunications industry can justify standards. Additionally, we have seen that there are both positive and negative aspects to asymmetric standards. These ambiguities are consistent with the disparate state commission policies evident in the NRRI survey. In this final section, some policy recommendations are offered based on the previous discussion.

Minimum Threshold Symmetric Standards

Some minimum threshold quality-of-service standard appears appropriate for the telecommunications industry. On an efficiency basis, dominant firms have an incentive to distort price-quality offerings, this is especially true when consumers have less information regarding quality than firms. Minimum standards can help reduce the inefficient distortions. Further, minimum standards help ensure that all consumers are offered at least a “basic” level of quality, rather than low-demand consumers receiving a poor price-quality combination to prevent switching. The result is less discrimination and less inequity. Thus, minimum standards can enhance both efficiency and equity.

These minimum standards require a careful balance. The minimum standards should ensure consumers a “basic” level of quality. This “basic” level of quality must be sufficient to ensure public safety and basic commercial needs. The telecommunications industry is an important resource for public safety and economic development. However, the quality must be sufficient to ensure these benefits come to fruition. At the same time, the “basic” level of quality must not be so high as to

eliminate numerous price-quality combinations. Consumers maximize welfare through purchases that closely match their preferences. Excessive standards eliminate price-quality combinations that could match some consumers' preferences. Thus, there must be a fine balance between standards that promote public safety and economic growth and preserve consumer choice. State commissions and the Telecommunications Act of 1996 are moving the local telecommunications industry in this direction.

Production efficiency can justify symmetric standards. Production efficiency generally outweighs allocative efficiency. By encouraging entry and investment, asymmetric standards can stimulate additional competition and improved allocative efficiency. However, higher aggregate industry costs can accompany the allocative efficiency gains when entry and investment occur by inefficient firms. The higher aggregate industry costs result in production inefficiency. In most instances, this production inefficiency will exceed the allocative efficiency gains. This is not to imply that entry and investment are unimportant or harmful. Competition encourages cost based pricing, product competition, and price-quality combinations that meet consumers' demand. But, this competition should arise from firms with cost functions and product offerings that are efficient. Symmetric standards will help create an environment where this can occur. With a minimum threshold, the regulatory burdens should not create an environment where market entrants are at a significant competitive disadvantage vis-a-vis the incumbent.

As competition emerges, it is important to ensure that the dominant incumbent does not use its market power to thwart efficient entry and investment. Predatory behavior is a more likely scenario with pricing than with quality. For example, the dominant incumbent could use interconnection pricing to squeeze the competitors' margins and foreclose competition. Schankerman suggests that symmetric rules can prevent predatory behavior by ensuring that the dominant incumbent has less opportunity to use its market power to foreclose entry.²⁷ While predatory pricing is the

²⁷ Schankerman, "Symmetric Regulation."

major concern, some opportunity remains for the incumbent to use quality to disadvantage entrants. For example, the incumbent could provide resellers with an inferior quality level. But, the Telecommunications Act prohibits this discriminatory behavior.²⁸ In this respect, minimum quality standards and the Telecommunications Act help ensure efficient entry and investment will occur in the emerging telecommunications industry.

Underlying Service Provider Responsibility

Unbundled access and resale create situations where several firms influence quality-of-service. Yet, the services must still meet a minimum threshold quality standard. This raises accountability questions. One solution has the firm providing the underlying service being subject to the quality standard. Facilities-based carriers and resellers purchasing the incumbent firm's underlying service would not be responsible for the quality standards. The incumbent firm would be responsible for meeting the standards on these underlying services. However, the facilities-based carriers and resellers would be responsible for all aspects of quality for the underlying services they provide. In this manner, the firm controlling quality is responsible for meeting all applicable standards. Tying provision of the underlying service to standards may create fewer administrative and legal problems than holding the facilities-based carriers and resellers purchasing the underlying service responsible for their entire service package.

Final Remarks

Quality-of-service remains an important and difficult challenge for state commissions as the telecommunications industry evolves towards competition. Quality

²⁸ 47 U.S.C. § 251.

standards can continue to serve an important role in the evolving environment. Minimum threshold standards can enhance both efficiency and equity where dominant firms and unequal information between consumers and firms are present. Both conditions remain in the current telecommunications environment. Further, symmetric quality standards are desirable in most instances. Symmetric standards create an environment where efficient and responsive firms can enter, compete, and profit. This competition encourages lower prices and product competition in ways that satisfy consumers' demand. At the same time, industry costs are minimized. The regulatory policy does not create false profit signals that can encourage inefficient entry and investment. Finally, unbundled access and resale further complicate application of symmetric quality standards. Holding the underlying service provider responsible for quality standards may create the fewest administrative problems. Quality standards and their symmetric or asymmetric application remain important issues as state commissions move from economic to a more protective regulatory environment.