

## SYMPOSIUM INTRODUCTION: CONVERGENCE, COMPETITION, AND REGULATION

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### 1. INTRODUCTION

This special issue of *Industrial and Corporate Change* is devoted to recent developments in telecommunications policy. With the exception of Joseph Farrell's contribution,<sup>1</sup> the papers in this volume were presented at a conference held at the University of California, Berkeley on the 27<sup>th</sup> and 28<sup>th</sup> of June 1997 titled "Bridging Digital Technologies and Regulatory Paradigms."<sup>2</sup> We are delighted to be publishing them here.

While the conference was broadly concerned with business strategy and public policy developments in the telecommunications sector, the notion of *convergence* provided a unifying theme. The papers published in this special issue reveal the importance of convergence as a fundamental feature of the business and policy landscape. Although the majority of these papers do not discuss convergence directly, the issues that they raise are strongly influenced, or even driven by, convergence. The papers are primarily concerned with policy issues that arise as the telecommunications industry moves toward a competitive market structure made possible by

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<sup>1</sup> Farrell's paper is a written version of a speech that he gave as Chief Economist of the Federal Communications Commission.

<sup>2</sup> This was the third annual conference of the Consortium for Research on Telecommunications Policy. The conference and the Consortium are supported by a grant from the Ameritech

technical and political advances. Each of these issues, however, is made significantly more complex by convergence and the introduction of new technologies and business models that blur traditional market and service boundaries.

## 2. CONVERGENCE

**The Notion of Convergence.** Use of the term *convergence* has not converged. To some people, convergence refers to a phenomenon confined to the telecommunications sector. To these commentators, convergence refers to the emergence of what one of us has labeled the *Swiss army network*: a single integrated infrastructure capable of delivering voice, video, and data services. The technological driver of this form of convergence is the continuous stream of advances in digital transmission technologies. Once a variety of different messages are converted to digital form they can be treated similarly in many ways and all are readily processed by computers. This view is summarized by the aphorism that “a bit is a bit.” As it turns out, this is a somewhat misleading characterization. While a bit is a bit in a static sense, dynamics are critical. Some bits (*e.g.*, those carrying a telephone call) need to arrive quickly in order to provide acceptable service quality, while other bits (*e.g.*, those carrying an e-mail message) can stand to wait a few milliseconds. Some services can also tolerate lost bits (*e.g.*, voice conversations) whereas others crucially depend on accuracy (*e.g.*, data file transfer). These differences notwithstanding, technologies such as Asynchronous Transfer Mode are hailed as being able to provide high quality service for all types of messages.

Within-telecommunications-sector convergence also can take place at a business, rather than physical network level. For example, Congress and the Federal Communications

Commission (FCC) recently took steps to remove cross-ownership restrictions and other public policies that limited telephone companies' abilities to provide video services and cable operators' abilities to provide telephone services. The objective is to allow a single company to offer a broad array of local distribution services, whether it chooses to do so with a single integrated network or by constructing several parallel networks. Ameritech, for example, is entering video distribution by constructing separate cable systems.

To others commentators, convergence is a process which cuts across the telecommunications and computer industries and that refers to the melding of communications and computers. Computer/communications convergence materializes in the form of networked computing (the seamless interconnection of otherwise isolated computers) or intelligent networks (the integration of large amounts of intelligence in the fabric of communications networks). Some proponents of computer/communications convergence take it a step further. They believe that the computing and telecommunications industries themselves will merge. This is, however, the theory that led to AT&T's rather unsuccessful forays into the computer industry.

Yet another view is that convergence consists of the structural integration of industries that provide transmission media and those that generate content. Examples of this kind of convergence include the extensive vertical integration that exists between cable programming networks and cable television systems operators and, more recently, the creation and delivery of information and entertainment by on-line services such as CompuServe and America Online.

One reason that use of the term convergence has not converged is that to date we have not seen much of it in any form. Despite the technical opportunities for digital convergence, and notwithstanding a few widely publicized business ventures (and planned ventures) aimed at capturing these opportunities, the provision of convergent services has fallen far short of

expectations. Perhaps the most visible example is the push for multimedia that motivated several attempted mergers of large cable and telephone companies. It is significant that Time Warner recently backed off its pursuit of the full service network and also has dissolved its partnership with US West. For its part, US West went on purchase the fourth largest multiple system operator, Continental Cablevision, but then divested itself into a telephone company and a cable company claiming that the cost of delivering telephony and video over a hybrid fiber-coax network is prohibitively costly.<sup>3</sup>

**Drivers of Convergence.** While progress has been slow, most industry observers expect the process of convergence to continue, albeit not at the pace that has been predicted in the press. Perhaps not surprisingly, given the different interpretations of convergence, there is disagreement about what has driven and will continue to drive convergence. Is convergence driven by technological change that is creating vast economies of scale and scope in transmission? Is convergence the private sector's response to fundamental changes in public policy? Or is convergence a new marketing strategy driven by economies of scope in sales promotion, customer care, and billing?

We believe that the answer to these questions is "All of the above." We also believe that the relative importance of the various drivers depends on the notion of convergence one is analyzing. The digital revolution clearly is pushing the development of integrated networks and integrated service delivery. However, as noted earlier, we are witnessing the emergence of multiservice firms even where they are not building multiservice networks. In addition to Ameritech's video strategy discussed above, AT&T and several of the Bell Operating Companies

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<sup>3</sup> Vince Vittore, "It's Lights Out for Convergence," TELEPHONY, 233:18, Nov. 3, 1997, p.7. Nevertheless, the company plans to explore video delivery over existing copper plant using digital subscriber line technology.

have toyed with various forms of wireless video delivery.

One of the drivers for moves toward multiservice firms is the desire to take advantage of economies of scope in marketing, billing and customer care. Many firms see the offering of bundled services as an opportunity to tailor rate and service offerings much more closely to the tastes of specific consumers, thus building greater consumer loyalty and increasing provider revenues. While there have been changes in billing and marketing technologies that may have increase economies of scope, many of these economies have been present for some time. Thus, one must turn to some other factor to explain the timing of the development of multiservice firms. We believe that regulatory changes are a large part of the explanation.

### **3. REGULATION**

At the same time that telecommunications technology has been going through significant changes, telecommunications policy has been going through even more sweeping changes. In February 1996, the U.S. Congress passed the Telecommunications Act of 1996 (the 1996 Act),<sup>4</sup> perhaps the most significant shift in United States telecommunications policy since the Communications Act of 1934, which serves as the foundation of U.S. telecommunications policy.

The 1996 Act engineered a fundamental shift in the relationship between public policy and competition in telecommunications markets. For much of the last 60 years, regulators in the United States and many other nations have protected incumbents from competition in order to generate monopoly profits (on a subset of services, at least) that could be used to fund new facilities and to ensure carriers' willingness to serve all segments of the public. In contrast, the underlying theory of the 1996 Act is that public policy should promote competition in order to

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<sup>4</sup> TELECOMMUNICATIONS ACT OF 1996, Pub. L. No. 104-104, 110 Stat. 56. The 1996 Act amends the Communications Act of 1934, 47 U.S.C. §§ 151 *et. seq.*

achieve greater innovation and service quality at lower costs and prices. While federal regulators, as well as many state commissions, have been moving in this direction for a number of years, the 1996 Act should accelerate this process and lead to greater policy uniformity across the states.

To many people, the 1996 Act has been a disappointment. It was passed with great fanfare. At the time, supporters of the 1996 Act were promising the quick realization of a new era of competition. Consumers were promised lower prices and higher quality for all. Telecommunications suppliers were told that there soon would be no need for pervasive regulation. To date, this is not how things have worked out. Prices in long distance and cable television have risen, and little new entry has taken place. The FCC and the states are issuing regulatory orders at an unprecedented pace. By the one-year anniversary of the 1996 Act, many were labeling it a failure.

We disagree with this assessment. The 1996 Act is not a failure: It made significant and much needed changes to telecommunications policy and, as we discussed above, it codifies a fundamental major change in the attitude of public policy toward competition. That said, the 1996 Act was dramatically oversold and there are important areas (perhaps most notably universal service policy) in which it falls short of truly meaningful reform.

The extravagant claims for the Act appear to have been based more on political exigencies than business realities. Congress and the President both faced upcoming elections and were criticized for their failure to cooperate resulting in gridlock and the absence of significant legislation. As a result, there was tremendous pressure “to do something” and to claim that whatever was done would be significant.

The 1996 Act rode through Congress on a wave of claims based on the promise of new technologies, especially digital convergence. Implicit in the debate that led up to the Act and in

its wording is the belief that both new and established telecommunications firms will invest in the technologies that will make competition a reality. As might be expected, Congress failed to anticipate the full range of business strategies firms have chosen to adopt, including partnering with others and waiting to see how some issues resolve themselves before committing billions of dollars in investment. The firms themselves fueled lawmakers' enthusiasm with every announcement of plans for cross-market entry, every projection of low costs for delivering new services with new technologies, and every prediction of strong consumer demand for advanced services. Reality fell far short of the prognostications, pointing out the importance of a more objective and comprehensive assessment of likely business strategies.

Nearly all parties underestimated the difficulties of creating effective competition in regulated telecommunications markets. There was no reason to expect rapid competition: Investments are simply too large to expect across-the-board entry on a compressed time scale. Indeed, in light of the fact that no one has definitively shown that local distribution markets are not natural monopolies, one would expect potential entrants to be wary. While we do not support the view that natural monopoly conditions in these markets justify public policy restrictions on entry, these conditions do make the emergence of competition questionable.

Entry is also made difficult by the need to incumbent-entrant coordination. Because a subscriber to a network benefits from being able to communicate with others, and because of the inefficiencies associated with building overlapping facilities, it generally is efficient for competing carriers to rely on one another's facilities to complete calls made by subscribers on one network to subscribers on another. Software and personnel systems designed to accommodate intercarrier sales are very complex and must process a huge volume of transactions extremely efficiently. This has made the interconnection of systems more difficult to accomplish and more difficult for policy

enforcers to monitor than most participants in the policy debate had anticipated.

Turning to expectations regarding the degree of regulation, we disagree with those who attempt to blame the FCC for thwarting the goals of the 1996 Act by promulgating excessive rules. There was every reason to believe that the 1996 Act would lead to more, not less regulation. First, the 1996 Act provides only the outline of regulatory change; it does not provide the detailed rules needed to define policies that actually can be implemented and enforced. Second, the 1996 Act mandates that incumbent local exchange carriers (ILECs) supply elements of their networks (*e.g.*, local loops) on an unbundled basis and that they terminate other local carriers' traffic. The 1996 Act also requires ILECs to sell their services wholesale to other carriers who may then sell these services at retail under their own brand names. This policy approach was adopted both because it may be efficient for incumbent network owners to share facilities with other service providers and because doing so encourages entry by reducing its sunk costs and risk. However, as noted above, interconnection issues are very complex and the details matter. Thus, a policy that defines the terms of interconnection and forces incumbents to unbundle their networks inevitably leads regulators into detailed regulation of specific components of the local exchange networks to an unprecedented degree.

#### **4. COMPETITION**

Although an interventionist interconnection and unbundling policy is inherently difficult and complex, many people including us believe that such a policy is essential to the development of competition in local distribution markets. Convergence raises important issues for both interconnection policy and for the development of competition more generally. Indeed, at the most fundamental level, convergence raises the issue of whether competition will develop and

what form it will take. Is convergence a driver of competition and deregulation, or will convergence promote industry consolidation and create the need for additional regulation?

**Convergence as a Source of Entrants.** Supporters of the 1996 Act hailed convergence as the source of increased competition. Under this view, the so-called digital revolution and other technological changes have created economies of scope that cut across formerly separate markets and thus create incentives for an incumbent in one market to enter into other markets. Many of the regulatory changes embodied in the 1996 Act were intended to allow firms to respond to these hypothesized incentives. Proponents of the 1996 Act envisioned both market extension and product extension diversification by established carriers. For instance, cable companies were to provide local telephone service over upgraded versions of the networks that they use to distribute cable-programming services. Similarly, telephone companies were expected to enter into video distribution deploying new fiber networks or upgrading their copper facilities. The hoped-for result was that, where once there were two monopolists, now there would be two multiservice oligopolists. And both cable and telephone companies were expected to play increasingly large roles in the provision of Internet access and other data services.

The 1996 Act also envisioned *de novo* entry of firms building their own networks which either would interconnect with incumbent networks or supplement network services purchased from incumbent carriers. Much of this new competition was anticipated as coming from the deployment of innovative technologies. While this increased competition has not emerged as quickly as many had hoped, it has not been nonexistent. Examples of *de novo* entry based on new technologies include the use of Internet telephony (*e.g.*, by Qwest<sup>5</sup>) and high-capacity digital microwave transmission for local distribution (*e.g.*, WinStar).

**Convergence as a Driver of Concentration.** Convergence can be a source of increased competition if it creates new entry incentives and opportunities. One must, however, also consider the possibility that convergence may be a driver in the opposite direction. Instead of two monopolists in local distribution, the future may be a single multiproduct monopolist. Moreover, that monopoly may to some degree spread to data, long distance, and wireless services through bundling.

In part, the strength of convergence as a driver of concentration depends on how much convergence is a process of moving toward integrated services at the level of actual service provision, as opposed to the repackaging services provided by others. If the efficiency of integrated networks is a key driver, then economies of scale and scope, as well as sunk costs, are likely to be large, and the consolidation of existing providers is more likely. Moreover, entry may be impeded. If all providers offer integrated packages of voice, video, and data services (and do not unbundle their services for sale to other carriers), then a potential entrant might also have to come in to the industry as a multiservice provider, which will be riskier to the extent that it entails bearing greater sunk costs.

The question of the vertical scope of telecommunications firms also arises. For instance, do economies of scale and scope extend to the joint provision of content and conduit? In light of the rather limited technological linkages, content providers need to understand the delivery capabilities of the conduit, but not much more—it is difficult to see how they would. Some may argue that the need for content and conduit to work together gives rise to a chicken-and-the-egg problem: a network capability is not valuable unless there are applications that take advantage of it, but there is little value to an application that cannot be delivered. It is far from clear, however,

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WALL STREET JOURNAL, Dec. 15, 1997.

that integration rather than arms length cooperation is needed.

We believe that one should be similarly skeptical of claims that scope economies extend across the computer and communications industries create economic incentives for providers to be active in both industries simultaneously. Computers have become an integral part of the design and production of automobiles, but that does not imply that auto manufacturers should build computers as well.

If the driver of convergence is the advantage of multiservice marketing, convergence may have different effects on industry structure than when the driver is economies of scope in transmission. Under marketing-driven convergence, there is less of a need for retail service providers actually to produce everything they sell. If there are not strong economies of scope in production, then economic forces will push telecommunications providers toward alliances or branded resale packaging rather than investing in the facilities needed to offer a full range of services on their own.

The effects that convergence and regulatory change will have on competition can be fully understood only if one considers how incumbents will respond to the possibility of entry. Faced with the possibility of increased competition, many network providers will likely seek ways to differentiate themselves. There at least four broad strategies that have gotten widespread attention:

- (1) *Bundle Conduit With Content.* Despite the fact that there appear to be little or no technological linkages between content and conduit, companies are pursuing strategies that couple conduit with proprietary programming. Following the advice that “content is king,” they see proprietary content as a means of achieving differentiation. To date, several of the attempts to do this (*e.g.*, the two joint ventures set up by collections of

Regional Bell Operating Companies in part to arrange proprietary content for their video distribution systems) have not been overly successful.

- (2) *Bundle Intelligence With Transmission.* Another way to avoid the commoditization of transmission services is to bundle the transmission network with processing capabilities or intelligence. Long distance carriers provision of software-defined or virtual private networks is a step in this direction, as are follow-you-anywhere telephone numbers. At this point, it is an open question whether such a strategy will be viable, or whether users may instead rely on smart terminals and relatively dumb networks.
- (3) *Bundle Multiple Services.* Perhaps the most highly-touted competitive strategy is for carriers to bundle together multiple retail services that were formerly sold separately. The services could include non-telecommunications products as well. Earlier this year AT&T announced a partnership intended to deliver Internet access, home security, electric power, and natural gas in a single package offering.<sup>6</sup> It remains to be seen whether consumer benefits and cost savings that come from bundling and dealing with a single source for billing, customer service, and repair are real or imagined. If they are real, then incumbent providers appear to have the advantage over new entrants: they currently offer at least some of the services in the bundle and have an established reputation and brand recognition which entrants must acquire.
- (4) *Develop Proprietary Networks.* Telecommunications markets are characterized by network effects: the benefits that an end-user derives from belonging to a network rises with the number of end-users belonging to the same or compatible networks (that is, other

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<sup>6</sup> "Home-Services Alliance Forms," N.Y. TIMES, June 25, 1997. The other members of the alliance

networks with which the end-user can communicate through the network to which he or she has subscribed). The degree to which subscribers of one network can communicate with subscribers to another is thus critical to market performance. Moreover, when networks are not interconnected or interoperable, the size of a network measured in terms of its subscriber base can be a critical source of competitive advantage. This holds true both at the basic network level and in terms of the ability to two networks jointly to offer advanced services. For example, as the Internet continues to evolve, some services may be available only when there is single, end-to-end provider, while other services will traverse any network.

Bundling strategies and the exploitation of network effects all raise issues for interconnection policy. Concern with proprietary networks is one of the reasons that policy makers have intervened and mandated interconnection for telephony networks. These policy issues are far from settled, however, and there are even bigger unanswered questions in the area of data networks, such as those of national backbone service providers on the Internet. With the continued growth of the Internet, one can expect these issues to grow as well.

Increased economies of scope, the increased use of multiservice bundling strategies, and a rise in the importance of network effects all are economic forces associated with convergence that may promote concentration. Whether these factors will reduce competition depends critically on if and when wholesale markets and interconnection standards develop. The development of wholesale markets and interconnection agreements are, in turn, going to be strongly influenced by public policy. The 1996 Act takes pains to mandate interconnection of networks and to ensure nondiscriminatory access. To the extent that the 1996 Act is successful in giving carriers access

to all subscribers, it will have the effect of mitigating the concentration effects stemming from convergence.

Interconnection policy will shape whether convergence promotes new and increased competition, or results in further consolidation and concentration. Consequently, the regulatory treatment of interconnection and unbundling is the single most important and difficult area in telecommunications policy today.<sup>7</sup> And it is likely to remain so for many years to come. Not surprisingly, issues of interconnection and unbundling lie at the heart of the papers in this special issue.

## **5. THE PAPERS**

Professor Joseph Farrell has dealt with these issues first hand. For much of 1996 and 1997 he served as Chief Economist of the FCC. In “Prospects for Deregulation in Telecommunications,” he provides an insightful overview of the issues confronting regulators as they grapple with changes in the technological, legal, and economic environment. He is concerned with weighing the costs and benefits of alternative means to move the industry from its current highly regulated state to one characterized by competition or at least much less regulation. Obstacles that stand in the way of an easy, rapid transition are many and formidable. Large, sunk investments offer incumbent providers a means to discourage entry by new carriers. At the same time, technology is advancing daily making many of these investments economically obsolete.

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<sup>7</sup> There is a second area in which policy reform is needed before competition can become a reality in many local markets: universal service. Current universal service policy relies on implicit cross-subsidies supported by the exercise of market power. There are also explicit subsidies raised from certain subsets of providers and services and paid out to different subsets of providers and services. Both aspects are incompatible with competition. The 1996 Act calls on the FCC to work with state regulators to reform universal service policy, but provides little in the way of guidance or statutory authority. Indeed, there is little reason to believe that Congress is interested in meaningful reform if such reform would result in higher prices to a significant number of

This presents a problem for regulators who, through their long association with incumbents, may feel obliged to ensure recovery of past investments.

Farrell proposes four principles to help regulators balance these conflicting objectives. Each principle has as an underlying goal the promotion of new entry into markets inhabited by franchise monopolists—whether facilities-based or through resale of network and retail services.

The first principle concerns a fundamental tradeoff in deregulating markets. Regulation has the intended effect of limiting the exercise of market power in the form of high prices. Farrell observes that regulation also has many unintended effects that limit firms' incentives to innovate and their abilities to engage in socially beneficial, flexible pricing. The first principle states that it may be wise to accept the greater short-run exercise of market power that accompanies rapid deregulation in return for the longer run benefits that derive from greater innovation and competition.

The second principle states that, in addition to considering the effects of regulation in the current competitive environment (which Farrell labels *ex post* analysis), policy makers should also consider the effects of regulation on the evolution of that environment (*ex ante* analysis). In particular, Farrell suggests that deregulation is likely to create incentives for facilities-based entry and thus one should deregulate faster than might appear prudent based solely on the examination of current market conditions.

The third principle argues that there is a need for decision rules for deregulating the sharing of facilities. Farrell identifies crucial features of the industry that should govern when and how the duty on incumbents to share their networks is lifted. The final principle contains recommendations on how regulators can move away from the “culture of entitlement to broad

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consumers or a more efficient (and visible) means of taxation to fund the program.

subsidies that encrusts telecommunications policy.”<sup>8</sup> Specifically, it offers guidance on how to modify universal service programs and other regulatory schemes so as ~~not to erect~~ to approach allocative efficiency while not erecting unnecessary barriers to efficient entry.

A common issue unifying the four principles is the timing and pace of deregulatory initiatives and the criteria used to evaluate the success of those efforts. Farrell focuses on the tension between dynamic and static incentives for efficiency, placing greater emphasis on the importance of correct dynamic incentives. His paper conveys the subtleties of the uneasy coexistence of competition and regulation that is inevitable on the road to telecommunications competition. The subsequent three papers attempt to offer solutions to more specific but nonetheless important problems raised by this coexistence. Each of these papers is concerned with a situation in which a firm has a bottleneck monopoly (any firm offering retail service must *e.g.*, local loops). The wholesale price at which the monopolist sells this component to other service providers is known as the *access price*. A retail service provider combines access with other components (*e.g.*, local switching) that it supplies itself. The first two of these three papers, Steven Wildman’s “Interconnection Pricing, Stranded Costs, and the Optimal Regulatory Contract” and Daniel Spulber and Gregory Sidak’s “Network Access Pricing and Deregulation,” characterize welfare-optimal access prices in markets where the access monopolist itself offers retail service and faces entry by a firm providing only retail services.

As Wildman notes, it is widely recognized that if a telecommunications provider is forced to price each service at marginal cost, the carrier will not be able to recover its full costs. To allow a network provider to raise capital and continue making investments, it is necessary to price

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<sup>8</sup> P. \_\_\_\_.

at least some of its retail and wholesale services above marginal cost. The amount to be recovered through pricing above marginal cost is known as the *access deficit*.

Recovery of the access deficit has proven to be very controversial along two fundamental dimensions. First, there is the issue of the pattern of markups. For a given amount of cost recovery, how should the markups be apportioned across various services? How much should come from retail services and how much should come from the pricing of services that are provided to interconnecting carriers? The second big issue concerns the calculation of the costs that need to be recovered through markups. Wildman examines both (a) which costs should be included in the calculation of the access deficit, and (b) how the access deficit should be recovered. Unlike previous authors, he explicitly focuses on the intertemporal nature of the problem.

The ILECs have generally estimated access deficits that are much larger than what other parties claim as appropriate. Wildman asks “under what conditions might the access deficit approved by regulators be deemed too large, so that efficiency goals would be better served by reducing it?”<sup>9</sup> He considers three reasons for such a conclusion:

- The incumbent has intentionally overstated its costs to regulators in the past.
- The incumbent is engaged in practices that from today’s perspective are seen as wasteful, either using inefficient production techniques or paying excessively high factor prices, including the return to capital.
- The incumbent is attempting to recover *stranded costs*, which Wildman defines as “investments in capacity approved by regulators in the past, when competitive entry was not anticipated, that currently is not fully utilized due to new capacity subsequently introduced by

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<sup>9</sup> P. \_\_\_\_.

entrants.”<sup>10</sup>

Wildman argues that the recovery of stranded costs cannot be determined without reference to the *regulatory contract*, the typically implicit understanding between an incumbent and its regulator. After considering several possible forms of the regulatory contract, Wildman turns his attention to the efficient regulatory contract.

He constructs a two-period model in which he takes the level of investment as given and asks how the fixed costs should be recovered over time. As he notes, it is simply an intertemporal interpretation of a standard Ramsey problem. No entry is possible in the first period and the incumbent enjoys a (regulated) monopoly. With an exogenous probability, entry occurs in the second period. The entrant is at least as efficient as the incumbent. The firm<sup>2</sup> faces Bertrand competitors in the retail market so that, if entry occurs, competition drives the retail price down to the sum of the access price plus the entrant’s cost of its complementary input. The regulator’s problem is to maximize total welfare subject to ensuring the incumbent’s expected, discounted profit is nonnegative.

Wildman shows that, when the entrant has lower costs than does the incumbent, the optimal post-entry retail price is lower than the pre-entry retail price. Wildman also shows that the margin between the retail price and the provider’s cost of the complementary input can be either higher or lower post-entry, depending on demand conditions.

Using the fact that the post-entry margin is equal to the access price, this finding can be contrasted with the so-called Efficient Components Pricing Rule (ECPR), a pricing proposal that has played a central role in the debate over access deficit recovery. In the present setting, this rule sets access price so that it covers the incremental cost of providing access (here, 0zero) plus the

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<sup>10</sup> P. \_\_\_\_.

profits that the incumbent forgoes by not making the retail sales itself at pre-entry retail prices. Thus, unlike Wildman's rule, the ECPR access price holds the margin between the retail price and the service provider's cost of the complementary input constant at pre-entry levels. The contrast between Wildman's result and the ECPR highlights the fact that the ECPR fails to take into account fully how entry may change cost conditions and thus may change the optimal retail prices.

Like Wildman, Spulber and Sidak also solve for welfare-maximizing access prices. The constraints in the regulator's optimization problem differ from Wildman's model, however. Whereas Wildman requires the incumbent's expected, discounted profit to be nonnegative over the life of the investment, Spulber and Sidak require the incumbent's post-entry profit to exceed its pre-entry profit. When this condition holds, the incumbent would voluntarily allow entry at the regulated access price.

Spulber and Sidak examine the consequences of this "voluntary access condition" for three kinds of competition in the downstream market: Bertrand, Cournot with free entry, and monopolistic competition. In each case they find that: (a) the voluntary access constraint is binding; (b) entry occurs if and only if the entrant has lower costs; and (c) social welfare increases when entry occurs. It is worth noting that results (b) and (c) do not imply that entry occurs if and only if doing so raises social welfare. There are at least two reasons for this. First, with differentiated products, one must look at quality and variety, as well as cost. Second, as the authors discuss, even entry by an inefficient firm may provide welfare-improving price competition and may lower retail prices.<sup>11</sup>

Spulber and Sidak derive the equilibrium retail service price along with the optimal access

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<sup>11</sup> This result does not arise in Wildman's model because the regulator has sufficient information and policy instruments to set the optimal retail price itself.

charge. ~~Regardless of the form of competition, b~~Because of the need to satisfy the voluntary access condition, the access charge exceeds the incumbent's incremental cost of providing bottleneck services--regardless of the form of competition. The markup varies inversely with the intensity of downstream competition, and in each case just allows the entrants to break even. They also find that the optimal access charge is less than the ECPR access price for all three forms of competition. The reason for this result is that the lower access price leads to greater volumesales of access and thus allows the incumbent's overall profits to be maintained despite the lower margin.

It is important to note that the welfare-optimal access price in Sidak and Spulber's model depends on the pre-entry retail price. As Farrell points out in the opening paper, pre-entry prices may play a role in determining incentives for potential competitors to venture into these markets. In the Spulber and Sidak model, the dependence is motivated by equity since access prices generate the revenue required to make the incumbent whole at pre-entry prices. This contrasts with efficiency reasons such as pre-entry retail pricesand, hence, access pricesignaling to new firms the cost of providing the competitive service.

As noted above, Farrell argues for the importance of *ex ante* analysis, which examines how regulation affects the incentives of potential entrants to enter and of incumbents to discourage or accommodate entry. The papers by Wildman and by Sidak and Spulber also are concerned with the effects of regulation on entry. In each paper, the authors find that welfare optimal prices often induce new firms to enter if doing so is efficient. However, the scope of these results is limited by the stark entry process that they consider: any entrant must rely on the incumbent monopolist to provide access and the entrant must provide the input itself. As Farrell discusses, actual firms choose from a far richer set of entry strategies, ranging from complete

facilities bypass to complete service resale. Furthermore, as Farrell notes, over time, entry strategies are likely to evolve to reflect changing market conditions and developments in the entrant's market position. Given the form in which entry is modeled, the later papers do not analyze how regulation affects these important choices. Longer run issues as to whether and when the entire network becomes competitive are not addressed.

Professors Massimo Colombo and Andrea Rossini also model the problem of bottleneck pricing in their paper "Ownership Structures in Network Industries When the Rationality of Regulators is Bounded." Their approach differs from the previous two papers on this topic in two crucial aspects.

\_\_\_\_\_ First, Colombo and Rossini consider an additional market structure. As in the two preceding papers, there is one firm with a monopoly over the provision of access services. Colombo and Rossini compare *asymmetric vertical integration* (the industry structure examined by the other authors in which the monopoly access supplier also competes in the retail service market) with *vertical separation* (the access monopolist operates independently of the retail service providers).

\_\_\_\_\_ Second, and more important, Colombo and Rossini severely limit the regulator's ability to control access prices. In particular, their regulator cannot detect fraud with certainty and when it does detect fraud, it is unable to impose unlimited fines ~~when it does~~. The regulator sets access price equal to the cost reported by the bottleneck monopolist, but imposes an expected penalty that is proportional to the difference between the reported cost and the true cost when that latter is uncovered in an audit. The constant of proportionality measures the effectiveness of the regulator, and as long as regulation is not too effective, the bottleneck monopolist will overstate its cost of production. In comparison, the regulator in the two preceding papers has complete

knowledge of the cost of providing access services.

The authors find that in most, but not all, cases social welfare is higher when the monopolist integrates downstream into the competitive component. In those cases, the bottleneck monopolist overstates its costs to a smaller degree compared to when it is vertically separated. The reason lies in the fact that the incentive to inflate access costs is diminished upon integrating forward. Given the fixed proportions technology, an unintegrated upstream monopolist captures nearly all the monopoly profit by setting the monopoly access price at least up to the point where it risks incurring the penalty. After integration, the access price serves the added function of raising (downstream) rivals' costs while the incumbent's downstream affiliate implicitly pays the true cost of bottleneck services.<sup>12</sup> The bottleneck monopolist's inability to commit not to engage in such a "price squeeze" reduces overall profit. As a result, the marginal benefit of inflating costs is smaller under integration than separation at least in the case of Cournot competition with linear demand and cost symmetry.<sup>13</sup> Accordingly, output under the integrated structure is greater than under separation, resulting in higher total welfare. This result contrasts with some of Vickers' conclusions in a similar context where forward integration by a bottleneck monopolist harms welfare.<sup>14</sup> The difference in results is due to the fact that the regulator in Colombo and Rossini's model is boundedly rational, in addition to confronting limited information as does the regulator in Vicker's model.

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<sup>12</sup> We note, however, that when the integrated firm believes that an increase in its retail sales will lead to an offsetting decrease in access purchases by the other firm, the integrated firm implicitly bears the inflated access cost as an opportunity cost.

<sup>13</sup> Note that, because there are no joint and common costs between the two components, the integrated monopolist does not have the opportunity to conceal its true cost of producing the access component.

<sup>14</sup> John Vickers, "Competition and Regulation in Vertically Related Markets," *REVIEW OF ECONOMIC STUDIES*, Vol. 62, 1-17, 1995.

When the unintegrated entrant is more efficient, Colombo and Rossini's conclusion may be reversed. In that case, when the entrant has a sufficiently large cost advantage over the incumbent, separation leads to higher welfare because it does a better job at allocating production to the efficient producer than when the bottleneck monopolist executes a price squeeze on the entrant.

Colombo and Rossini's paper demonstrates that the usual intuition about welfare effects of integration by a bottleneck monopoly into the market for which access is an input may depend on the effectiveness of regulators. In particular, the usual standard leverage arguments against local exchange company entry into long distance service do not automatically apply. This conclusion supports Farrell's position that "we may need to commit in advance to policies that will seem somewhat 'too deregulatory' in each instant application."<sup>15</sup> Alternatively, we may choose to devote resources to improving the effectiveness of regulation with the goal of approaching the optimal access pricing rule.

The scope and effectiveness of regulatory powers is the topic of the final paper in this volume by Evan Leo and Peter Huber. In "The Incidental, Accidental Deregulation of Data ... and Everything Else," they document how regulators have ignored or neglected certain "fringe" data services over the years, either deliberately or unintentionally. Examples include teletext carried on the vertical blanking interval of broadcast television and the upstream channel on coaxial cable television networks. In time, these "fringe" services have come to threaten core telephony and video services that have long been overseen by these same regulators. This threat was realized by technologies that have created new uses for existing transmission media and improved capabilities of data services that were poor substitutes for existing services.

Here again convergence is instrumental in creating competition where none was thought to exist. Over the past decade, beginning with the first triennial review of the AT&T divestiture,<sup>16</sup> Dr. Huber has ~~often~~repeatedly documented how the emergence of new technologies pose competitive threats to traditional telecommunications services. As with data services here, he exposed the futility of regulators' attempts to segregate telecommunications traffic by arbitrary distinctions (*e.g.*, wireline v. wireless, transmission v. content, one-way v. two-way). Such distinctions become impossible with digital convergence.

This raises the obvious question: Why did regulators choose not to regulate certain data services? Answers to this important historical question should offer insights into workings of regulatory agencies. One possible explanation hinted at by Leo and Huber is the inertia of the regulatory process relative to the fast pace of technological change in this industry. Another possibility is suggested by Colombo and Rossini: regulators like the FCC have limited expertise and resources to evaluate key technological parameters. Alternatively, harm to incumbent firms and to consumers was not perceived by either incumbents or regulators. Or perhaps simply no one expected fringe data services to expand in size and scope the way they have.

For whatever reasons they chose to forebear in the past, policy makers today face the following question: should they intervene in data services markets as they continue to grow and encroach on traditionally regulated services? In many ways, this question parallels one we asked earlier: Is convergence reducing the need to for regulation by stimulating new competition, or are the forces associated with convergence creating the need for additional regulation? The papers in this special issue help to answer both questions.

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<sup>15</sup> P. \_\_.

<sup>16</sup> U.S. Department of Justice, THE GEODESIC NETWORK, 1987 REPORT ON COMPETITION IN THE

## 5. CONCLUSION

We began this introduction by remarking that issues of convergence run through most of the papers, even if it does so in a largely implicit fashion. It is also worth noting that, while the papers address public policy issues, business strategy considerations underlie them. Although public policy will have critical effects on the attractiveness of entry and competition, it is private sector managers who will decide if and when entry takes place and what investments are made.

In several other instances policy makers have been disappointed when telecommunications firms failed to adopt business strategies that would propel the industry towards competition; in other cases strategies were devised that were not contemplated but bring added competition to these markets. For instance, the 1996 Act carefully structured terms and conditions on entry into local exchange markets to encourage interexchange carriers to enter and to pave the way for ILECs to participate in long distance services. In fact, a virtual standoff has emerged in which all the major interexchange carriers have retreated from their efforts to enter the local exchange by scaling back investment (*e.g.*, MCI), redirecting investment (*e.g.*, Sprint's wireless strategy) or abandoning their plans (*e.g.*, AT&T). At the same time an unanticipated response to the Act has been ILEC formation of competitive local exchange-carrier subsidiaries that would compete with other ILECs outside its region and with the parent operation inside the region.

Policy making is most effective if regulators are able to anticipate if and how business leaders will exploit the business opportunities afforded them through regulatory change. However, regulators and everyone else, for that matter have limited abilities to predict which business strategies will be adopted. And by creating new competitive opportunities, convergence only increases the regulatory challenges. In the light of the limited foresight possessed by all of

us, the best policies are those that are robust to surprises.

We expect the need for, and the form of, interconnection rate regulation and other types of government intervention to be hotly debated for years to come. The papers in this special issue provide numerous insights into this debate. We know that you will enjoy reading them.