INTRODUCTION

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Through our title, "Telephony, the Internet, and the Media," we intend to reflect the diversity of the Telecommunications Policy Research Conference. We also have more substantive reasons to group papers involving these seemingly different industries under the same roof.

One reason is the increasing difficulty of considering the policy problems of one communications industry in isolation from the others. Thirty years ago, probably the most significant relationship between telephony and the media was the cable industry's need for access to telephone poles to hang coaxial cable. Today, telephone companies and cable companies increasingly are offering each other's services to consumers, creating a maze of policy dilemmas that in the U.S. culminated in the Telecommunications Act of 1996. With the exceedingly fast growth of the Internet, from essentially nothing only five years ago, a third "industry"" has complicated communications policy still further.

On the input side, the Internet uses both telephone and cable facilities. The Internet's outputs include new communication forms that sometimes substitute for, sometimes complement traditional telephone service and media programs. Radio, newspapers, voice telephony and streaming video all are found in various stages of maturity on the Internet. It is not reaching to say that no longer can any telecommunications policy be strictly limited to a single communications medium.

A second reason to combine papers on various communications industries is the opportunity to

learn common policy lessons. Most communications industries share fundamental economic characteristics, such as strong economies of scale with respect to the number of consumers, and common social concerns, such as freedom of speech and privacy issues. As the chapters in this volume reflect, these common concerns are especially important for Internet research. Internet content control, standard setting, and network interconnection pricing issues, for example, parallel the same issues in the media or telephony. If policy learning for the Internet is to progress in the same blindingly fast "Internet years" that the medium itself is growing, it will be important to learn from experience in the media and telephony.

The remarkable pace of change that is merging the technological, economic, and policy issues in communications has continued unabated in the year since the last edition of the TPRC Selected Papers volume. There is no shortage of subject matter for TPRC authors! One major source of change in the U.S. has been the implementation of the Telecommunications Act of 1996. Some of the pro-competitive effects are emerging slowly, partly due to still-pending legal challenges to provisions for local telephone company entry into long distance service. The debate on Internet content control was highlighted by the Supreme Court nullification of the Act's content "decency" provisions. In major developments, the FCC implemented telephony access charge reform and issued rules to implement universal access reform. Notable in the latter was the convergence between telephony and Internet policy: a nonprofit corporation was formed to establish universal Internet access through schools and libraries. In addition, most states have been adjusting their policies to conform to the new federal law.

1997 was a big year for international policy. The World Trade Organization reached a major agreement on telecommunications competition, in which 69 countries, representing over 90% of world telecommunications activity, agreed on a framework for far-reaching liberalization. Some of the consequences are discussed in chapters below. There was also a major international debate about the governance of the Internet, with a focus on the ownership and allocation of property rights in Internet address names. An ad hoc international management authority was established, but it remains to be seen whether it is treated as authoritative.

Despite the heavy attention to telephony and Internet over the past couple of years, major developments continued in media policy. Notable in the U.S. were the promulgation of new guidelines for children's broadcast television, and mandated standards for a V-chip (a hardware device that allows parents to block access to programs carrying certain labels). The FCC also finalized its rules for allocating digital TV bandwidth to existing broadcasters, with a provision for auctioning reclaimed analog bandwidth in ten years.

The telecom industries were busy while domestic and international policies were being revised.

MCI agreed to be purchased by Worldcom for $30 billion in the largest U.S. deal ever. This deal combined the second and fourth largest U.S. long distance providers, and two of the leading Internet providers. Southwestern Bell and Pactel completed their $16.5 billion merger in April; Bell Atlantic and Nynex completed their $25.6 billion merger in August. New alliances among various national monopoly carriers were announced, in part anticipating the opening of cross-border telecom competition in the European Union.

With the continuing convergence and interaction between traditionally separate telecom industries, it is not easy to segment our 15 selected papers from the 1997 TPRC into well-defined categories. To assist the reader, we have organized the book in 5 general sections. The first is labeled "Historical," a category that is special to the 25th Anniversary edition of the TPRC. "Telephony," "The Internet," and "The Media," follow, and we conclude with "Comparative Studies in Telephone and Satellite Policy." Readers will notice repeated themes and cross-connections between the chapters in these sections.

Historical

Bruce Owen, in “A Novel Conference: The Origins of the TPRC,” sets the context by reviewing the TPRC's 25 year history and its contributions to telecommunications research and policy making. Owen describes the Washington in which the first conference was held in 1972, under auspices of the old Office of Telecommunications Policy, as a "lonely and inhospitable place" to the academically minded in telecommunications. In making its journey from that 15-presenter meeting held at the old Executive Building, to the far larger present-day conference, the TPRC has left a substantial wake.

In reviewing the TPRC's contributions, Owen cites both its "inputs": an extraordinary increase--from virtually zero--in the number of economists and other professionals employed by the FCC and other Washington agencies involved with communications policy; and its "outputs": the TPRC's role in the revolutionary reforms in telecommunications regulation. The FCC, he notes, now routinely considers economic welfare effects in its deliberations, and a whole new accompanying set of arguments frame the Washington debate on telecommunications policy. The unique contribution of the TPRC, Owen notes in conclusion, is the "invisible college" of communication researchers throughout the world that collaborate and deliver relevant policy analysis to government agencies.

Telephony

Recent U.S. telecom policy discussion has been dominated by the Telecommunications Act of 1996. This sweeping legislation was both a reaction to the major transformations in telecom technology and markets, and a (partial) roadmap to the future competitive landscape. Within this context, we have four chapters devoted to current issues in telephony. The first two concern regulation and competition in local service, while the next pair examine regulatory arbitrage pressures on international phone traffic.

In "A Technico-Economic Methodology for the Analysis of Local Telephone Markets." Farid Gasmi, Jean-Jacques Laffont and William Sharkey develop a framework for modeling regulation that combines forward-looking cost analysis with the modern theory of regulation under asymmetric information. The authors present both method and results in an approach that combines an engineering process model of telecommunications service costs with an economic model of regulation and competition.

Gasmi, et al use their model to examine several long-standing issues in telecom regulation. In one such analysis they find that despite the problem of private information not directly available to regulators, the deviation between first-best and optimal regulated prices need not be large. They also find that the optimal regulatory prices can be well approximated through reasonably simple linear pricing rules. The authors then apply the method to a comparison of alternative regulatory approaches. They present many interesting results, including support for the superior performance of price cap regulation.

Local service regulation in the U.S. and elsewhere must increasingly accommodate facilities-based competition. In the U.K., for example, most customers already have a choice between at least two providers. In the U.S. most wireline competition thus far has been through reselling (although wireless competition has been strong for over a decade), but cable providers and other overlay builders are preparing to offer competitive service.

Judith Molka-Danielsen and Martin Weiss, in "Firm Interaction and the Expected Price for Access," use a model related to that of Gasmi, et al, to assess the effects of local competition on access pricing and universal service. They model duopoly pricing between two firms with no subsidy for universal service. Molka-Danielsen and Weiss then calibrate their cost and demand functions to

proprietary data from multiple service areas. Without the cross-subsidy, penetration rates fall. The authors characterize the sensitivity of access prices and penetration to cost and demand conditions, as well as to the nature of strategic interaction between the two firms. One general conclusion is that fixed costs are sufficiently high that Bertrand (marginal cost pricing) equilibria are unlikely with only two facilities-based competitors.

The next two chapters examine consequences of the ad hoc system of accounting-based international "settlement" rates in a world where domestic deregulation and technological advance foster competitive adaptation. When regulatory price structures do not reflect cost or efficient bargaining outcomes, innovative service providers will seek ways to capture some of the regulatory inefficiency rents left on the table. In both of these chapters, we see that the market pressures leading to domestic telecom regulation reform throughout the world over the past two decades are now squarely challenging the framework of transnational regulation.

Douglas Galbi studies the consequences of regulatory by-pass opportunities in "The Implications of By-pass for Traditional International Interconnection." International voice transit is treated as a jointly provided service in most bilateral treaties, and the revenues are shared according to a fixed, arbitrary rule. Since the revenue share may be above or below a competitive return on service, countries with multiple international providers, such as the U.S., also have rules specifying the sharing of traffic volume among competing providers. However, following increasing liberalization of domestic competition, unregulated alternative transit will now be permitted by 52 countries through the WTO agreement. Other by-pass opportunities also exist. Galbi models the pricing and traffic volume strategies for competing carriers who can choose between settlements traffic and by-pass. Just as we have seen for domestic by-pass in the U.S. following AT&T's divestiture, regulated and by-pass traffic can co-exist in equilibrium. However, Galbi shows that by-pass opportunities impose dynamic and complex constraints on the policy effectiveness of internationally regulated rates. It appears unlikely that fixed accounting policies can implement desired policy outcomes in a world of increasingly dynamic and multilateral unregulated competition.

In the final chapter of this section, Mark Scanlan offers some surprising insights on the consequences of international regulatory arbitrage in "Call-back and the Proportionate Return Rule." Callback is a scheme to arbitrage artificial differences in international call origination prices. This type of arbitrage does not by-pass international settlement rates; rather, it reroutes calls to take advantage of different termination rates. Suppose that a French-U.S. call is priced higher when it originates in France. A callback service provides French callers with a special U.S. number to call. The system extracts the originating French number, and originates a circuit from the U.S. side from which the French caller can reach its U.S. party.

Scanlan reports that in 1996, 42 of 66 responding countries had declared callback services to be illegal. However, he shows that in most countries the provision of a callback service can increase the profits of the operator in the higher-priced country. A key feature of the argument straightforwardly illustrates how ad hoc pricing rules can stand intuition on its head: since international connection revenues are fixed and split according to formula, it doesn't matter to the operator who originates the call. But if lower end-user prices stimulate demand, the high-cost operator earns a windfall. Together with Galbi's paper, Scanlan's analysis suggests that the pressures for international rate reform in the wake of domestic reform will be great.

The Media

The first two of the three chapters in this group address content regulation in television.

Content regulation will probably always be with us; it certainly continues as a major focus for telecom policy. Although one of the major new stories of the year was the Supreme Court's decision striking down the Communications Decency Act as unconstitutional, content regulation in television is on the upswing after its near total eclipse during the broadcast deregulation era of the 1980s. Pursuant to the 1990 Children's Television Act, FCC license renewal guidelines that require stations to air three hours of children's educational television per week took effect in September 1997. Following the 1996 Telecommunications Act, the FCC has now approved the television industry's new program rating system, and issued technical rules for installation of V-chips in TV sets. The television content debates have important implications for attempts to regulate Internet competition as well.

Howard Shelanski, in "Video Competition and the Public Interest Debate," takes a broad legal and economic perspective on content regulation. His main idea is that the traditional economic "market failure" arguments --spectrum scarcity, a lack of sufficient competition, limited channel capacity, and a lack of direct payment mechanisms--are outmoded and no longer justify government content intervention. After reviewing the history of FCC content regulation since the 1930s, Shelanski argues that explosions in the capacity and competition of video media, including pay television and videocassettes, render these arguments irrelevant. However, the participants in current content regulation debates, such as those involving children's television, continue to rely on the traditional arguments.

Shelanski then points out that broadcast content regulations, although they cannot be justified in economic terms, might be justified in terms such as whether parental preferences can and should replace those of children because the children are not equipped to be gatekeepers. He makes the case that this and other non-economic arguments should be "unbundled" from the no longer appropriate arguments that regulation is needed to enhance program diversity or remedy gaps of economic inefficiency in privately supplied programming.

Angela Campbell, in "Lessons from Oz: Quantitative Guidelines for Children's Educational Television," turns to the specific issue of whether the FCC's children's television guidelines are likely to work, and how they might be improved. She does so by examining Australia's long experience with a children's television quota. That experience, she argues, suggests that quantitative guidelines can lead to an increase in the quantity of children's educational programming. The Australian experience, however, has demonstrated the tendency for broadcasters to exaggerate the quantity, quality or educational content of programming that is nominally intended for children. Australia has addressed these problems by determining in advance of a program's airing whether it meets the criteria for children's programming. Since the FCC, pursuant to the CTA, leaves the determination of whether programs meet its criteria to broadcasters subject to challenges by the public, it may be more difficult in the U.S. to assure that only programming meeting the definition is counted toward the guideline.

Campbell concludes with some recommendations for achieving the goals of the CTA. She argues that the Australian system in which the government pre-classifies programs in advance would probably prove unconstitutional in U.S. courts. Nonetheless, she recommends that the FCC consider providing a more helpful definition of "educational", and like the Australian government, examine whether sufficient resources for program production are available and whether resulting production values are equivalent. The FCC should also, she recommends, review the efforts of licenses on an annual basis.

The final chapter in the "Media" section is concerned with an issue of increasing importance: standard setting. David Sosa, in "AM Stereo and the Marketplace Decision," challenges the widespread assumption that the FCC's decision not to set an AM stereo standard in the early 1980's prevented AM stereo from becoming economically viable. The usual argument has been that uncertainty about a standard discouraged consumers from purchasing enough sets to realize a critical mass.

Sosa presents a statistical analysis of AM stereo adoption in three major markets in which AM stereo reached substantial penetration between the late 1970s and the mid-1990s. He tests the hypothesis that audience ratings of stations that adopted stereo radio broadcasting were

significantly higher than stations, which did not adopt. In only one of the three markets did results suggest that stereo diffusion had any effect on audience behavior. Although Sosa's results are somewhat ambiguous, his analysis does fail, in any of the three cases, to support the conventional wisdom--that market failure was the cause. Sosa cautions against interpreting the AM stereo experience as a government failure; low consumer valuation for this change in audio quality may tell a richer story about the failure of AM stereo adoption.

The Internet

In the first two of four chapters in this section, the authors deal directly with an obvious nexus of telecom policy interest: Internet telephony. The development of technology for full-duplex phone calls over the Internet brings to the fore the rapid transformation of telephony from natural monopoly to naturally competitive industry. We now see local and long distance telephony provided by traditional operators, Internet-based operators, and cable operators (for example, in England).

In "A Taxonomy of Internet Telephony Applications," David Clark provides a much-needed characterization of Internet telephony (IPTel). IPTel is not a single physical technology, nor is it a single service offering. Ignorance about the different technologies and possible services (nearly all of them are still conjectural) causes a great deal of confusion in the trade press and current policy discussions. For example, as Clark points out, the most immediately feasible service is his Class 1, which is long distance or international calling using existing local loops, but replacing long distance or international circuits with Internet links. Although there are three reasons why this might be a cost-effective alternative, the important reason is that it can operate as a form of long-distance access charge by-pass (or settlements bypass for international calls; cf. the chapters by Galbi and Scanlan). This is simply a form of regulatory arbitrage, much as we saw local-loop bypass operators perform regulatory arbitrage during the initial post-divestiture years. Fixing the regulatory inequity will leave Class 1 IPTel as a lower-quality, costly-to-install alternative to traditional circuit-switched telephony.

Understanding what IPTel can do, and the role of regulatory arbitrage, is important. For example, fueled by press releases heralding massive IPTel investments by companies like Qwest and Delta3, some congressional leaders are pushing the FCC to revise the Universal Service Fund contribution rules before IPTel overwhelms traditional telephony. Clark does not address whether fixing an access charge arbitrage opportunity by changing the universal service funding base is a

wise regulatory approach. Rather, he provides an extremely lucid and forward-looking characterization of IPTel necessary to address such policy questions. He illustrates this by closing with a few high-level policy implications that follow from an understanding of IPTel.

Lee McKnight and Brett Leida are Clark's colleagues at MIT; all three participate in MIT's Internet Telephony Consortium. In "Internet Telephony: Costs, Pricing and Policy," McKnight and Leida provide a detailed economic-engineering study of advanced IPTel service (Clark's Class 3 type). This service involves end-to-end Internet communication, with the phone handset attached to the user's computer. The public switched telephony network handles no component of the voice call, although the authors assume Internet connections are obtained by dial-in service over the local switched network. New capabilities can be provided to users because communications are intermediated by powerful end-node computers. McKnight and Leida find that moderate use of computer-to-computer Internet telephony can increase the costs of an Internet service provider by as much as 50 percent.

Current hype about Internet telephony may make it seem surprising that IPTel can raise costs by so much. But Internet technology is based on sharing ("statistical multiplexing" is the fundamental characteristic). IPTel is not particularly well suited for sharing: it has been shown elsewhere that the ratio of bursts to average data flow is only about 2-to-1, which means that after overhead and quality control buffering the efficiency gain from sharing cannot be much more than 1-to-1 (no sharing). Consequently, the authors estimate that holding times and call arrival rates will each increase by 20% in their main scenario. Further, customer service and billing costs tend to rise directly with new services. Thus, offering substantial IPTel service would require new capital and personnel investments. ISPs could not sustain this cost increase based on current levels of flat rate pricing. The authors believe that usage-sensitive pricing would become necessary before IPTel could commercially succeed. With these costs and the need for more revenue, it does not appear that IPTel will offer consumers large cost savings: rather, as Clark emphasized, the main advantage of Class 3 IPTel is likely to be the value of new functionality offered to consumers through integration with an end-node computer.

In the third paper in this section, "Muddy Rules in Cyberspace", Dan Burk is concerned with the evolution of intellectual property rights as digital networked distribution becomes easy and ubiquitous. Debates about intellectual property rights and digital copyright have become telecom policy issues because of the modern concern about obtaining a return for an author when digital works can be almost costlessly reproduced and distributed.

Burk points out that a critical working assumption implicit in many discussions of the copyright issue is largely incorrect: that the received wisdom embraces strong or complete property rights as

the ideal. He shows that in fact rights for tangible property are often "muddy", that is, there is ambiguity about certain claims to use property that can only be resolved through a subjective balancing test. Burk then argues that the nature of intellectual property makes muddy rules especially appropriate for certain types of use; fair use rules in copyright law are a long-standing tradition in this regard. Interestingly, Burk discusses a number of ways in which transaction costs will be higher for telecom-intermediated uses of intellectual property. This contrasts with another common pre-conception: that digital communications networks uniformly reduce transactions costs for commerce and exchange. In the end, Burk argues against a single "clear" rule for intellectual property in cyberspace, proposing instead that good legal rules should be as varied--and in some cases as muddy--as they are in real space.

The authors of the final chapter in this section describe the interaction between engineering and socio-political considerations when designing a system for describing and managing privacy rights on the Internet. In "Designing a Social Protocol: Lessons Learned from the Platform for Privacy Preferences Project," Lorrie Faith Cranor and Joseph Reagle, Jr., offer an insightful case study of socio-engineering design for the Internet, as well as constructive lessons on the problem of unintended consequences. Cranor and Reagle's paper is ostensibly about Internet concerns, but like Burk's paper it in fact deals with problems that are common to policy for all communications media.

The authors have been leading participants in the collaborative project to develop a system for expressing privacy preferences on the Internet and automatically negotiating the use of personal information. For example, current technology allows Web site owners to "set a cookie" or store an identifier on a user's hard drive, which can be checked during later visits or as the user moves across the Internet to track usage and activity.[1] The proposed P3P protocol would allow users to store a set of preferences specifying which types of personal information may be used for what purpose, by whom. While the goal seems sensible, the authors clearly describe how difficult implementation can be. Along the way they show how a poorly designed communications technology can have unintended, often adverse consequences. This point is not new, of course, but Cranor and Reagle use their experience from designing P3P to constructively suggest principles for "social protocol" design that can help avoid problems. Notably, they emphasize the goal of "mechanism not policy", and then illustrate this sound principle through a series of concrete examples. One very useful lesson for policymakers is the importance of trying to distinguish between technology design decisions and policy choices.

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[1] Most browsers can be configured to prevent cookies from being stored, but this requires some sophistication on the part of users, and makes some sites virtually unusable.

Comparative Studies in Telephony and Satellite Policy

Learning from experience around the world has always been a strong tradition at the TPRC. We include three chapters in which the authors examine satellite policy in the Asia-Pacific region, telecommunications reform in South Africa, and differences in recent telecommunications reform between the United States and Canada.

The first paper, "The Paradox of Ubiquity, Communications Satellite Policies in Asia," by Heather Hudson, is critical of what she describes as politically driven satellite policies in the Asia-Pacific Region. Along with a proliferation of regional and international satellites serving the region, seven individual countries, some of them very small, now have their own satellites, four of them launched since 1993, with at least one other planned.

Hudson questions the need for these satellites, and suggests that interaction between "national flag carrier syndrome," and liberal ITU policies for granting slots to individual countries, is responsible. Hudson finds that while lip service is paid to universal service and other social objectives, in reality slots in some smaller countries have been turned over to private investors in exchange for negotiated compensation, to the neglect of social goals. Hudson concludes with recommendations on satellite policy: countries need to create incentives for investment in the terrestrial networks that will interconnect with satellite transmissions; countries need a regulatory structure in place, and interconnection agreements with terrestrial networks; and that user needs must be accounted for more directly. These policies will at least insure, she predicts, that the satellites will be used effectively.

Robert Horwitz's paper, "Telecommunications Policy in the New South Africa: Participatory Policies and Sectoral Reform" tells an unusual story. We read harsh critiques about reform efforts in various countries that have stagnated or degenerated into self-interested rent seeking. In contrast, Horwitz praises the South African process of telecom reform as a politically legitimate, innovative process of consensus building among stakeholders. As a consequence, rather than being pushed aside by private interests, questions of redistribution--notably universal service and the "general public interest" -- remained on the front burner.

South African reform began in 1991 with the creation of a Telkom, a state-owned telecommunications monopoly, through splitting up a classic PTT. Real change began with establishment of the National Telecommunications Forum (NTF), a public participatory process modeled after other South African reform initiatives coinciding with the dismantling of apartheid following the 1994 elections. Negotiations in the NTF between the main stakeholders--Telkom, labor, and business interests--resulted in draft legislation specifying a three-to-five-year period of exclusivity for Telkom over basic switched telecommunications services, together with provisions for interconnection, free entry into long distance and other services, a reformed universal service

fund among other provisions. To be sure, Horwitz notes, the process had its faults. The draft bill was seriously compromised in a ministerial review, and attention to universal service was sometimes more rhetorical than substantive. And, we should not forget that implementation of the South African reforms has yet to be accomplished. Overall, though, Horwitz describes the reform process leading to the legislation as a model process: "technically viable and for the most part, politically legitimate."

The final paper of this section is also a study complimentary to one country's recent telecommunications regulatory reform. Willie Grieve and Sanford L. Levin, in "Telecom Competition in Canada and The U.S.: The Tortoise and the Hare" give high marks to the Canadian reform process leading up to a May, 1997 ruling that established rules for local telephone service competition. They argue that the rules will lead expeditiously to true facilities-based competition at the local level. The United States is likened to the hare for getting off to a much quicker start than the Canadian tortoise, but stopping before the process was complete.

Grieve and Levin believe the U.S. Telecommunications Act of 1996 has created a "shade tree" which they claim "may actually entrench monopoly and market power in the local networks of the incumbent local carriers." The authors focus on the different approaches to unbundling and resale taken in the two largely parallel reform movements. Both the Canadian and U.S. reforms are comparable in their requirements for interconnection of incumbent networks with those of entrants. Grieve and Levin argue, however, that the American legislation mandates excessive unbundling, and sets unrealistically low prices for resale of unbundled network elements by not requiring a sufficient contribution to an incumbent's fixed costs. The Canadian reform, on the other hand, limits unbundling and resale requirements to only the "essential facilities" of incumbents. The result, the authors claim, is that market entrants in the US entrants have inadequate incentives to engage in true facilities-based competition, and will simply continue repurchasing and reselling elements of the incumbent's networks without providing true competition for them. In Canada, they believe, the law encourages entrants to construct competing facilities, which many analysts agree must be the basis for true local telecommunications competition.

THE EDITORS

This book was edited while David Waterman was Associate Professor in the Department of Telecommunications at Indiana University, Bloomington, and Jeff MacKie-Mason was Associate Professor of Economics, Information and Public Policy in the Department of Economics, and in the School of Information at the University of Michigan, Ann Arbor, Michigan.