Global Competition in Telecommunications

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October 24, 2000

Abstract

Discussions of globalization, the Internet, and e-commerce typically emphasize the increasing pace of change. However, for firms, policy analysts and policy makers, a key challenge is to identify those aspects of the industry that are likely to change the most slowly. A firm needs to identify its key competencies, which are exactly those skills that it builds and exploits in the midst of rapid change. Policy analysts and policy makers need to identify key industry structures that are relatively stable and will shape future industry growth. Thus the need for analysis of industry structures and the importance of industrial policy does not lessen in the turmoil of the 'new economy'. Rapid industry change, because it makes such structures less obvious, makes such analysis more important. To be intelligible, government policy, which is intrinsically slower to evolve than commercial activity, will increasingly have to focus on affecting industrial structure.

Note: The published version of this paper is Chapter 8, pp. 256-272, in Gary Madden, ed., *Traditional Telecommunications Networks, The International Handbook of Telecommunications Economics, Vol. I* (Cheltenham, UK: Edward Elgar, 2003). This pre-publication draft is freely available at www.galbithink.org

[1] The opinions and conclusions expressed in this paper are those of the author. They do not necessarily reflect the views of the Federal Communications Commission, its Commissioners, or any staff other than the author.

In the mid-1990s a series of global alliances among established telecommunications companies was widely considered to point to the future of international telecommunications competition. Deutsche Telecom, France Telecom, and Sprint formed Global One. British Telecom and MCI joined together in a venture called Concert, while AT&T put together a looser group of carriers under names World Partners and Uniworld. Each of these ventures sought to build further links with operators around the globe in anticipation of competing to provide a one-bill bundle of services to customers around the globe.

All that has survived of the major global alliances of the mid-1990s are the brand names that they established. Competition has instead primarily developed in different directions. One is toward vertical industry segmentation. The Internet, meaning networks that can be connected using a particular set of globally standardized data networking protocols, is developing to provide a global platform for service competition among a wide range of independent companies. Another direction of competition is toward building wholly owned end-to-end networks among major global business centers. Such an ownership structure provides major advantages for rapidly implementing new network capabilities and rolling out services that require such capabilities.

The failure of major global telecommunications alliances highlights the rapid change and uncertainty in the telecommunications industry. Economic analysis cannot eliminate this uncertainty or provide a fail-safe means for predicting the future. However, analysis of the economics of the telecommunications industry and the responses of firms and policy makers can contribute significantly to a better

understanding of the issues and possibilities. This Chapter will outline key aspects of industry economics, firm organization, and public policy that are relevant to understanding the globalization of telecommunications competition.

I. Industry economics

A. Cost trends for long distance communications and their implications

Developments in fiber optic technology are rapidly reducing long-distance communications costs. In the 1990s the investment cost per Mbs of capacity for long-distance fiber optic communication fell by about a factor of 100 (see FCC [1999] Table 7), and that trend is likely to continue. Dense wavelength division multiplexing technology currently can provide in commercial systems 560 Gbs across a single 3600 km optical fiber without opto-electronic regeneration (for a good review of technology trends see AIEAC [1999], Appendix 5). These trends have led some industry observers to speak of the 'death of distance' and 'infinite bandwidth'.

Nonetheless, it is important to recognize that the fixed costs of long-distance communications systems are significant and have not fallen. TAT-7, the last coaxial cable constructed between the U.S. and Europe, cost $180 million to build. In contrast, TAT-11, which went into operation in the year 2000 and uses advanced fiber optic technology, cost $1500 million to construct (FCC [1999]). Laying communications wires, whether coaxial or fiber optic, is a labor-intensive operation that is not likely to experience dramatic productivity gains. Developments in fiber optic technology are

reducing communications costs by greatly increasing the economies of scale in providing communications capacity.

While developments in fiber optics have tended to overshadow the role of satellites in providing long-distance point-to-point communications capacity, satellite capacity and fiber capacity differ in important ways. The fixed costs of installing long-distance satellite and fiber systems are roughly comparable and are not likely to change greatly in the future. On the other hand, fiber offers much greater economies of scale in transmission while satellites offer much more flexibility in deployment and re-deployment. An international cable needs the cooperation of authorities and operators on both ends of the cable to provide service.[2] Incumbent national operators typically are positioned between an international cable and the cable's potential end customers. In contrast, satellite systems provide naturally go end-to-end and can be easily redeployed for transmission between different end points. The relative value of economies of scale in capacity versus flexibility in deployment will depend on the magnitude of capacity demand and the risks associated with that demand.

Large economies of scale in international capacity have the potential to destabilize prices for international capacity. Such a development has been avoided largely in two ways. First, incumbent operators have traditionally owned international capacity through ownership shares in Intelsat and consortia created to own and operate undersea cables. Thus incumbent operators have not bought international capacity through decentralized, arms-length transactions. The incumbent operators, who naturally

[2] The Africa One cable system, which circles Africa, provides an example of how cable operators can mitigate some of their geographic risk. Africa One will be profitable as long as enough countries in Africa find it worthwhile to connect to the loop, while which countries connect is not important.

seek to preserve their established position, have through such organizations significantly influenced the growth of international capacity, the price of capacity, and the availability of capacity to newly interested parties.

In addition, other arrangements have been established that raise transaction costs for acquiring international capacity. In particular, international capacity has traditionally been owned on a half-circuit basis. This means that in a cable connecting the U.K. to Japan, companies operating in the U.K. have been given 'U.K. half-circuits' while companies operating Japan have been given 'Japanese half-circuits'. Establishing a connection between the U.K. and Japan requires 'matching up' U.K. and Japanese half-circuits. As compared to 'full circuit' ownership shares, the convention of 'half-circuit' ownership shares raises transaction costs and increases barriers to entry in providing international services. To acquire capacity, a new entrant must negotiate with two 'half-circuit' owners as compared to one 'full circuit' owner. Such arrangements help to limit the development of a liquid market for international capacity.

A new firm can seek to establish a business limited to building and selling international communications capacity, but such a firm invariably has to confront the economies of scale in capacity and the sustainability of a business limited to selling such capacity. The trajectory of Global Crossings business plan is instructive. Global Crossing was established as a firm that built and sold international capacity. But it soon changed its business plan and bought major local exchange carriers in the U.S. It is now investing significantly in international data centers. Project Oxygen, another company that put forward ambitious plans to build a business around selling international capacity, recently folded. Until international capacity can be sufficiently differentiated to mitigate

the economies of scale in its construction, a liquid market for international capacity is unlikely to develop. Instead owning international capacity will serve as an important entry ticket for providers of a range of other global telecommunications services.

B. Particular economics of wireline and wireless local links

Partisans of wireline or wireless technology tend to put forward the view that one of these technologies will dominate. Proponents of the position that 'wires always win' argue that the capacity and quality of wireline services, along with the fact that people spend much of their time in specific physical locations (home or office), will make wires the dominate conduit for communications. The 'only mobile' position argues that mobility is so important to users that wireless technology will trump wireline for all but intensive communications applications such as corporate data centers and Internet service providers. These positions point to firms or organizations being distinguished between those that bet primarily on wireline technology and those that bet primarily on wireless technology.

To better understand the implications for global competition, the essential differences between wireline and wireless technology need to be understood. Wireline and wireless technologies essentially differ in their use of spectrum. Wireline technology offers protected, private 'spectrum' to a specific point. Signals are transmitted over copper wires by utilizing the electromagnetic spectrum along the wire. Signals are transmitted over fiber optic lines by utilizing their optical spectrum. In contrast, wireless technology uses public, 'free space' spectrum to transmit signals.

These differences in spectrum use point directly to fundamental economic differences. Since wireless signals are transmitted through free space, they give users mobility, which has considerable economic value. On the other hand, they are subject to interference from intruding users and physical phenomena, and they require public arrangements for sharing or acquiring spectrum. The trend toward spectrum auctions has made spectrum a large fixed cost associated with providing wireless service. In contrast, local wireline spectrum can be continually installed, making local wireline network construction nearly a constant cost technology in terms of the number of users connected. Thus, while wireline networks are often considered to involve large sunk costs, with large wireless spectrum acquisition costs wireline technology provides greater potential than wireless for sustainable competition among a large number of network operators.

Even in the long term, the relative advantages of wireline and wireless technology are likely to vary from place to place. From a static perspective, wireless spectrum acquisition costs will vary significantly from country to country based on spectrum availability and methods for allocating spectrum. Wireline network construction costs depend significantly on local physical geography and labor costs as well as the political economics of acquiring local right-of-ways and avoiding appropriation of sunk capital through a variety of public and private means. Over time, wireless technology will benefit from the 'silicon economics' of an expanding global market for standardized digital equipment. Wireline technologies are much less subject to this dynamic, because they require much more local physical labor. But increasing consumer communications demands, which are likely to vary in nature and intensity from place to place, will continually re-enforce wireline technology's advantages in capacity and quality.

Because the relative advantages of wireline and wireless technologies differ from place to place, neither wireless nor wireline technology is likely to dominate globally. This factor will constrain the scale and scope of global operators. Currently wireline and wireless technologies are separated organizationally, and Vodaphone, one of the world's leading wireless operators, has no significant local wireline assets. Competition will increase between wireline and wireless networks, and service providers will increasingly look to build flexibility to operate across wireline and wireless networks. Wireline and wireless technologies will provide an additional sustainable technological dimension of global competition in communications services.

C. Alternate paths to security and reliability

Security and reliability of communications networks have traditional been associated with the characteristics of physical routes. End-users particularly concerned about security and reliability would demand that infrastructure providers provide physical network paths with documented provisions for redundancy and security. Security and reliability understood in terms of the physical characteristics of the underlying network tends to force service providers to integrate from the end-user service down through the physical network. This is necessary for physical network characteristics to be offered as part of service offerings to end users.

Software-based means for providing security and reliability in communications will lessen this pressure for vertical integration. Software methods can significantly substitute for physical redundancy and security. With respect to reliability, dynamic routing using a large number of paths and fault-tolerant communications protocols can

substitute for reliability in the underlying physical infrastructure. Such techniques are an important aspect of the Internet, and they are likely to continue to be important in new network protocols. With respect to security, encrypting information can substitute for the security of physical links. Software-based methods for assuring reliability and security are not perfect substitutes for physical network attributes. But in an economic sense, they don't have to be. Productivity improvements in data processing will make software the most economic way to provide the most economically relevant levels of reliability and security. This means that end-user demands for security and reliability in communications around the globe will not drive ownership of physical infrastructure.

D. The search for a stable position in the value distribution

The current distribution of value associated with telecommunications no longer has a solid economic foundation. Traditional voice telephony is a mature product that generates a large amount of current revenue. In the U.S. in 1998, consumers paid telecommunications carriers about $200 billion for local, wireless, and long distance voice telephony (see FCC [2000] Table 19.1.). Telephony revenue, however, is highly vulnerable to industry change (see Madden and Savage [2000] for empirical analysis of developing competition in U.S. international services). A fundamental economic fact is that the cost of switching and transport has been plummeting.[3] Thus, for example, while U.S. long distance end-user revenue is about $88 billion per year, the capital cost of a network to provide these services probably would cost only a few billion dollars. The

[3] John Sidgmore, Vice Chairman of MCI WorldCom, emphasized this point in a June 1999 stock analysts' meeting. He noted that switching and transport amounted to 63% of MCI's backbone investment in 1988, while in 1998 investment in switching and transport had fallen to 25%. He projected that it would fall to under 10% in the next few years.

cost of creating mass brand awareness is much more important in providing long-distance telephone service than is network infrastructure costs (see Galbi [1999]). On-net telephony could be offered for free as part of a broader business plan, and this is a likely direction for the development of Internet telephony.

Internet services offer great promise but little current revenues for network operators. The total 1998 U.S. data communications services market[4] is about 10% of telephony end-user revenues, and the cost of Internet core network services is about 1% of telephony revenues.[5] Capital market valuations for Internet-focused companies are highly speculative and subject to rapid gyrations. A key challenge facing mass market Internet services is that consumers are not accustomed to paying for information and services on the Internet. Real-world economics recognizes that consumers' habits mediate between what consumers value and what consumer pay for. The spread and extent to which consumers will become accustomed to paying for different sorts of services received through the Internet will significantly affect the value distribution in telecommunications.

In an important and provocative paper, Odlyzko [2000] has argued that communications infrastructure value will predominately be associated with business and personal communication, rather than content. Odlyzko notes that in the U.S. telephone

[4] U.S. data communications services market size is based on data in "1999 Market Forecast", *Data Communications* (Dec. 1998).

[5] Using data released in MCI's sale of its Internet backbone to Cable & Wireless, Odlyzko [1998] notes that MCI Internet revenue in fourth quarter 1997 was $386 million on an annual basis. Since the MCI backbone is estimated to carry 20-30% of Internet backbone traffic, Odlyzko estimated that annual revenue from U.S. domestic internet core services is $1.1-$1.6 billion at year end 1997. MCI's Internet revenue includes about $60 million for dial-up access (MCI had 250,000 consumer accounts, 60,000 business accounts, and 1,300 ISP accounts. See Rickard [1998]). Odlyzko also presents other figures that support core internet revenue (excluding revenue for dial-up access) being about $1.5 billion at year end 1997. Given an Internet growth rate of about 100% per year, mid-year 1998 annual revenue would be about $2 billion.

industry revenues are significantly greater than total advertising industry revenue, and that the U.S. postal service generates more revenue than the entire U.S. movie industry. These comparisons suggest that neither advertising nor content creation is likely to be able to provide communications infrastructure firms with revenues comparable to those today. Odlyzko's paper seems to presume that communications infrastructure revenues must remain comparable to what they are currently. But the technological trends described above suggest that infrastructure costs are likely to become less significant over time relative to creating services and marketing, ordering, and billing for them.

The distribution of value among local infrastructure, wide-area (national and global) infrastructure, communication services, content, and network-based commerce is likely to be continually destabilized. Technological dynamism, unpredictable and volatile consumer preferences, and complex regulatory and political dynamics will prompt continual re-arrangements in firms' business strategies. This increase in uncertainty is not merely a feature of the transition from monopolized national communications industries to global competition; it is a fundamental characteristic of global competition in communications. Galbi [2000] argues that physical coordinating points for network interconnection and content distribution will be relatively stable loci of value creation, in the same way that cities are relatively stable loci of value creation in the physical economy. While the physical location of cities do not change rapidly, the dominant economic activities in them does: a port city becomes a financial center, a fur-trading outpost becomes a center of the software industry. Firms and policy makers in the communications industry will be continually struggling to cope with economic changes that will come increasingly rapidly.

II. Business structures and strategies

A. Incentives to expand geographic scope

Many telecommunications providers, like many other businesses, have strong incentives to expand operations across nations (Jamison [1998]). In the *Wealth of Nations* Adam Smith elaborated a logic of economic growth: the division of labor is limited by the extent of the market. In modern terms, one might say that the value of a competency is limited by the scope of the opportunities. Telecommunications providers expand internationally to exploit core competencies across a larger set of opportunities. A company that is good at managing wireless networks has all wireless networks across the global as its scope of opportunity. In this example, a key question is whether there are important differences in the skills needed to manage wireless networks in different countries. Because of the emergence of global network equipment markets and a trend toward deregulation, technical competencies in network operations and services increasingly have global applicability. Moreover, global customers seek services that are well integrated across national borders in both technical and customer-service dimensions (provisioning, billing, maintenance, etc).

Another incentive for global expansion is risk diversification. In addition to general macroeconomic and political risks, communications industry growth rates are likely to vary significantly across countries in ways that are difficult to predict. Given low telephone penetration rates around the world and the well-established value of this service to customers from many different backgrounds and cultures, there is huge

potential for telephony service growth around the globe. In the past this potential has been repressed by poorly performing government-owned telecom monopolies. Liberalization, industry restructuring, and new regulatory approaches are rapidly removing these sorts of obstacles in many parts of the world. To lessen the risks of any particular country achieving its growth potential, businesses linked to telephony service growth can position themselves to exploit growth that might occur in a number of countries.

In developed countries, future growth in the communications industry will depend on industrial and political capacity for institutional change, and consumer reaction to new services. In the development and applications of new communications technologies, the U.S. may increasingly lag behind other countries. Finland, Japan, Korea, and Sweden are leading developments in different areas of broadband wireline services, wireless applications, and interactive TV. Companies that want to assimilate successful experience and technology, and that want to influence cutting-edge industry standards, need to be operating where leading industry developments are taking place.

In contrast to the domestic operations, participants in international commerce have to deal with important cultural differences and the absence of a common, overarching legal framework. Such differences are particularly significant in telecommunications markets because the services exchanged are complex and the regulatory framework is crucial. Internationalizing a company is a means to lessen transaction costs and to facilitate quicker reactions to new business opportunities. Organizing a new type of relationship or a new type of operation can be done more quickly and more cheaply in the context of an existing relationship. Within an existing

relationship, time and capital has already been expended to establish understandings and ways of doing business. This is particularly important in the context of increasing industry uncertainty and concomitant needs for business flexibility and reaction speed.

B. Organizational history

The history of firms' efforts to organize to provide international service illustrates the challenges involved. While Sprint and AT&T announced domestic VPN service in 1985, it was not until 1990 that Sprint and Cable & Wireless together attempted to set up a Global Virtual Private Network. In 1991, AT&T attempted to facilitate the implementation of advanced global services by proposing a Global Virtual Network Services Forum (GVNS). Twenty-three teleco's were invited to join and ten accepted. GVNS largely failed to be a distinctive force and standardization efforts were folded back into the rather slow moving ITU-T, the International Telecommunications Unions' telecom standardization forum. Subsequently AT&T formed a somewhat closer group of carriers under the rubric of World Partners, although the market significance of this partnership was also questionable.

In the mid-1990s some major operators established equity-based alliances (see Galbi and Keatings [1996] for further details). In 1994, BT and MCI finalized a $4.3 billion deal in which BT acquired 20% of the equity in MCI. The deal included the establishment of a joint venture named Concert, in which BT had a 75% equity stake and MCI a 25% stake. In 1994 Sprint, France Telecom (FT) and Deutsch Telekom (DT) also announced an equity-based alliance. FT and DT each purchased a 10% stake in Sprint. The parties established a venture named Global One, which was to be 'the principal

embodiment and global reference point of the International Telecommunications Services Business of the Parties.' In 1995 AT&T formed a joint venture called Uniworld, which combined Telia of Sweden, Swiss Telecom, KPN of the Netherlands, and Spain's Telefonica. The exact nature of this venture was never clear, but it appeared to be an attempt to establish a tighter relationship than those previously established through large groups such as GVNS and World Partners.

None of the above equity partnerships lasted to the end of the year 2000. BT, after its stockholders' resistance and WorldCom's competing offer thwarted its bid to buy MCI, sold its stake in MCI, acquired full ownership of Concert, and then combined international operations with AT&T under the existing Concert brand name. Unlike agreements under the earlier alliances, the BT-AT&T venture requires each company to sell global services solely through Concert. Subsequent talks between AT&T and BT on further integration emphasize the trend toward forming a single organization for providing global services. Poor coordination and conflicts among the partners made Global One ineffective, and in early 2000 France Telecom bought out the venture. Other companies, such as MCI WorldCom, have consistently pursued a strategy of unified ownership of a global network.

Parallel to this turbulent organizational history has been the continuing importance of the structure of bilateral relations that provides for international telephone service (for more details see Einhorn Chapter in this International Handbook). Since the early days of telephony international telephone calls from country A to country B have been completed based on a bilateral agreement between operators in country A and country B. Such a system of bilateral agreements has several weaknesses. One weakness

is that it involves high transaction costs. The number of agreements needed rises with the square of the number of international telecommunications operators. With 233 countries and one carrier per country, about 27000 agreements are needed for traffic exchange. The entry of new carriers in many countries has created the need for an even larger number of bilateral agreements under this organizational structure.[6]

The bilateral systems has additional weaknesses. The bilateral framework does not allow for savings and innovation associated with multilateral facilities planning and routing. One study has estimated the potential savings of multilateral routing to be on the order of 10% (see Nam [1994]). The most prominent weakness of the bilateral framework is that interconnection rates for international telephone calls (called settlement rates or accounting rates) have been greatly above costs. These high rates have been very significant factors in the balance sheet of carriers in developing countries (for a description of the situation in Jamaica, see Myers [1999]). However, these high rates lower world welfare, generate international tension around allegations of 'unfair subsidies' (see Melody [2000] and Stanley [2000] for discussions of some of the disputes), and attract alternative entrepreneurial ventures that might be more usefully directed elsewhere (see Scanlon [1996] and Choi *et al.* [1999]).

The Internet itself can be understood as a standards-based global partnership among a huge number of networks. Given the failure of efforts among telecommunications operators to use similar organizations to foster new international services, the Internet's growth from obscurity in the mid-1990s to huge global importance by the year 2000 has been a major surprise to telecommunications operators

[6] The entry of new carriers has also historically involved the development of cartel-like rules such as proportional allocation among domestic carriers of incoming international traffic. For analysis of these

and national policy makers. A noteworthy but often neglected aspect of the Internet is that domestic and international interconnection arrangements are largely undifferentiated. Interconnection protocols and institutions have the same form globally. Other organizations for international communications have distinguished domestic interconnection from international interconnection largely because of nations' incentives to try to shift rents from foreign persons to domestic persons (see Galbi [1998]). Some parties have recently expressed concern that, despite the Internet's architecture and organization, such rent-shifting is also occurring on the Internet. The evaluation and treatment of such concerns may play an important role in determining whether domestic and global communications remain undifferentiated on the Internet.

C. Economics of business structure

In considering international expansion, telecommunications firms have a range of options that can be summarized as 'build/buy/partner/rent'. Building a network in a foreign country typically requires a large amount a capital, time, and knowledge of local regulatory, political, and market factors. Advantages of building include being able to install uniform, state-of-the art network technology, tailoring the network to a specific business plan, and gaining maximum knowledge of and control over network costs. Buying an established network through an acquisition of a network owner allows faster entry and involves the acquisition of knowledgeable local employees as well as a network. Experience has shown, however, that integrating established networks and associated operating systems is a major challenge. Some companies have sought to

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rules, see Galbi [1998] and Karikari [2000].

avoid these problems by buying dark fiber in an established company's network, and then building their own switching and operating systems fabric.

While partnering or alliances in global telecommunications has a checked history, it is likely to remain important. The computer industry illustrates how loose, rapidly changing alliances play a key role in establishing *de facto* industry standards. Standards associated with lower levels of the physical network can be established through loosely organized standards bodies. However, standards that relate more closely to service characteristics offered to end customers – products, provisioning intervals, and service level agreements – are more likely to be established through closer partnerships because they are crucial to companies' competitive positions.

Equity investments across members of a partnership can be a way to redistribute returns from partnership-specific investments. Assume, for simplicity, that partnership-specific investments must be undertaken by particular partners while customers choose which partnership member will offer them services. Suppose that two carriers each require a 10% return on investment and each must make a $30 million investment in an partnership. As a result of the partnership, one carrier will earn $4 million per year while the other carrier will earn $2 million per year. So as to make the investment in the partnership worthwhile, the second carrier might acquire a 25% equity share in the first carrier. More generally, the nature and scope of partnership-specific investments affects the opportunities for the partners, while transfers of common equity affect how the returns from the partnership are split between the partners.

However, as the literature on ownership rights emphasizes, the allocation of ownership rights itself can affect investment decisions (for a recent literature review, see

Shleifer and Vishny [1997]). Suppose, for example, that a partnership between a French carrier and Ghanian carrier offers a 10% annual return. The partnership is structured such that the French carrier pays $80 million and the Ghanian carrier pays $20 million. The French carrier in return gets 80% of the partnership earnings while the Ghanian carrier gets 20%. Suppose that, because of asymmetric information and limitations on the scope of enforceable contracts, not all the factors that affect the earnings of the partnership are specified in the partnership agreement. Each partner thus has to make some investment decisions independently based on expected return given the partnership rules. Suppose the Ghanian partner encounters an opportunity to invest $10 million to increase partnership income by $3 million annually. The return on this investment, 30%, is much higher than the return that the partners require. Nonetheless, because the Ghanian partner gets only 20% of the returns from the partnership, it will not rationally choose to make the investment. Thus assignment of ownership shares in a partnership also should consider the relative opportunities of the partners to make additional non-contractible investments that benefit the partnership.

Creating opportunities to rent parts of networks has emerged as an important regulatory direction. Regulators have sought to make some incumbent network operators provide unbundled network elements (UNEs), of which unbundled network loops have attracted the most interest. In contrast to resale of service offerings, use of UNEs typically offers more flexibility in configuration and use. Where UNEs are available, using them is the least capital-intensive way to gain control over network facilities in foreign markets. However, firms have typically made UNEs available only under regulatory duress. Using UNEs may require continual regulatory battles and changes in

UNEs use take place in an adversarial environment. Thus while UNEs offer control over network facilities, they may not effectively offer the ability to create rapidly seamless new services that require facilities-based innovation.

D. Strategies of competition

Global competitive strategies will depend significantly on substitution across established network technologies, the evolution of new local competitors, and the importance of service innovation. To get a sense for the different possibilities, consider first alliances or new global carriers created from groups of incumbent same-technology (wireline/wireless/cable) operators: territorial technological aggregation. A particular global carrier would dominate the domestic technology associated with one of its constituent incumbent carriers. Global carriers would compete across network technologies through new service offerings and geographically through mergers to expand the scope of their networks. Such a competitive structure would likely involve highly contentious intra-technology interconnection agreements, low inter-technology convergence and inter-operability, and the preservation of sharp distinctions between domestic and international communications. On the other hand, such a form of competition best preserves established routines and organizations, and hence would be least disruptive to businesses and governments.

An alternative competitive structure might be an internationalization of local competition. Under such a structure, global carriers would operate across technologies and global carriers would not be associated with disjoint 'home territories'. Moreover, there would not be a sharp distinction between domestic and international

communications, and interconnection agreements would be negotiated primarily with regard to domestic factors. Making local competition work independently of the nationality associated with the local competitor would require considerable discipline on the part of policy makers and competitors. Domestic policy makers would need to make strenuous effects to establish a clear, credible regulatory direction that can withstand the political clout of the domestic incumbent. New foreign entrants would need to have the vision and discipline to avoid seeking to appeal to their own national authorities as a business strategy for gaining local leverage. The internationalization of local competition is not likely to come naturally with invisible policy. But the effort to promote this form of competition is likely to bring the most rapid growth of the communications industry and the greatest benefits to consumers

III. Key global policy challenges

A. Institutionalizing policy expertise

New regulatory bodies with responsibility for the telecommunications sector are being set up in many countries in conjunction with liberalization and privatization of communications in many countries. Attracting qualified personnel and building an effective organization to meet rapidly growing policy demands is a significant challenge. This administrative constraint will itself push decision-makers toward simpler policies. Moreover, while sector-specific expertise is important for successful policy formulation and implementation, it does not necessarily have to reside only in a national regulator. Regional and multi-lateral organizations, universities, and independent research institutes

can also develop into repositories of policy experience and analysis. Such a multi-institutional approach is likely to be particularly important because of the significance of telecommunications to the economy as a whole and the need for flexible, innovative policy approaches in the face of rapid industry change.

Competition policy authorities are already playing an important role in establishing the regulatory framework in telecommunications, and they are likely to continue to do so in the future. Regulatory policy is often considered to be sector specific while competition policy is thought to consist of generally applicable rules. As Nihoul [1998/99] points out, in practice in the European Union this is not the case: there appears to be little substantial difference between competition policy and regulatory policy. In the U.S. the FCC has approved mergers with substantial conditions that are similar to those established in rule-making procedures. While regulators tend to move slowly in establishing industry-wide rules, re-organizations – through mergers, divestitures, and the establishment of new companies – will force policy-makers to make decisions promptly about how particular companies are allowed to operate. Such decisions will inevitably play an important role in shaping the over-all industry regulatory framework.

B. Making meaningful policy decisions

A largely unappreciated problem in telecommunications policy is focusing policy debate on meaningful choices. Policy debates about 'local loop unbundling' illustrate the problem. Such policies require a huge number of detailed implementing regulations, each of which can significantly affect competitors' profitability and the incentive to make large, sunk investments in infrastructure. To assess a policy of 'local loop unbundling'

one needs to know, among other factors, the definition of rate elements, the use rights associated with them, their prices, and the regulatory regime for ensuring functionality and effectiveness in operations support systems. Knowing only that policy makers require, or will require, local loop unbundling is to know very little.

In this way a superficial homogeneity in regulatory policy around the global may cloak large differences in interpretation and implementation. Most policy makers might advocate competition, deregulation, and universal service. But what sort of competition will be promoted? What regulations will change, and when? Is universal service considered to be inconsistent with competition and deregulation, and, if so, what will policy makers do to deal with the inconsistency? Such questions will be answered. If policy is not able to address these questions directly (and experience thus far is not promising) these questions will be answered indirectly through non-transparent, unaccountable, idiosyncratic means.

Cost-based pricing for telecommunications services is an important historical example of a globally recognized policy standard. This standard has been important in structuring arguments over the level of telecommunications prices. In particular, a party makes a cost showing to support a price, and another party either makes an alternative cost showing or provides some other reason for the price level, such as universal service. The standard of cost-based pricing has provided a workable discourse for resolving pricing issues. On the other hand, cost-based pricing has tended to place into the background the consumer and industry implications of different levels of regulated prices, and cost-based pricing has led to an international distribution of telecommunications prices that is not readily rationalizable in terms of underlying cost

differences. With increasing attention to international comparisons and policy effects, cost-based pricing is likely to become less important as a global policy standard in the future.

Telecommunications policy has to be based on simple, significant policy levers to be transparent, accountable, and amenable to homogenization globally. Statements of policy principles tend to assume that such levers are prevalent and obvious. But in fact, finding simple policy levers that can translate intelligibly policy intentions into implementations and outcomes is a major challenge. This is particularly true given the tremendous uncertainty and turmoil in telecommunications industries. Regulatory bodies that focus on analyzing and assimilating experience, and learning from it, are most likely to be best able to meet this challenge. Small countries have important advantages in assimilating policy experience and pursuing innovative policies, while large countries have the advantage of economic significance in creating *de facto* global policy standards. As the thorough review in Adamska [1998] indicates, what will emerge as significant global policy standards in telecommunications remains subject to considerable uncertainty.

IV. Conclusions

Discussions of globalization, the Internet, and e-commerce typically emphasize the increasing pace of change. However, for firms, policy analysts and policy makers, a key challenge is to identify those aspects of the industry that are likely to change the most slowly. A firm needs to identify its key competencies, which are exactly those skills that it builds and exploits in the midst of rapid change. Policy analysts and policy makers need to identify key industry structures that are relatively stable and will shape future

industry growth. Thus the need for analysis of industry structures and the importance of industrial policy does not lessen in the turmoil of the 'new economy'. Rapid industry change, because it makes such structures less obvious, makes such analysis more important. To be intelligible, government policy, which is intrinsically slower to evolve than commercial activity, will increasingly have to focus on affecting industrial structure.

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