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Regulation of Cybernetworks
and Telecommunications Carriers

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NATIONAL AND SUPRA-NATIONAL REGULATION OF CYBERNETWORKS AND TELECOMMUNICATIONS CARRIERS

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1. Introduction

The regulation of telecommunications systems and services reflects the dynamic interaction of technology, economic forces, institutional settings and constraints, interest groups, and so forth. This evolutionary process of change and adaptation takes place in an environment characterized by imperfect information, bounded rationality, differing value systems and preferences, and opportunism (Brock, 1994). This process has generated the two historical “prototypes” of sector organization: state monopoly and private regulated firms. In most countries, separate frameworks were established for telephony and broadcasting. Telephony was seen as “natural” monopoly and organized as a common carrier, subject to market entry and price controls. Broadcasting was regulated based on the perceived scarcity of the electromagnetic frequency spectrum and the merit good character of content.

These prototypes were gradually adjusted to accommodate new forms of telecommunications such as cable television, satellite communications, or terrestrial wireless communications. Usually, these new delivery systems were fit into the existing separate industry dichotomy, frequently creating hybrids. After a period of relative stability that ended gradually during the 1960s in the U.S. and with some considerable delay in other parts of the world, the unleashed dynamic of technology has transformed these prototypes into a vast array of divergent models of

telecommunications organization. These models have in common a higher reliance on market forces and commercial organization, the separation of regulatory and business tasks, and a general belief that competition is superior to regulation or government control. Again there seems to be a pattern of sector reorganization, leading from a deregulation of customer premises equipment via a deregulation of more specialized and non-publicly switched services to a broad liberalization of market entry into basic services.

Despite changes at the margin, such as reflected in the U.S. Telecommunications Act of 1996, the new approaches by and large maintain the separate industry model. As convergence has enabled different telecommunications systems to deliver similar if not identical services (Internet telephony, video on demand, cable radio, etc.) a paradoxical regulatory situation is created. Depending on the delivery technology, functionally equivalent services and applications may be subject to quite different sets of rules and regulations. This is particularly evident in the relation between cybernetworks and traditional telecommunications carriers. Conventional telecommunications networks are predominantly hierarchical, semi-transparent (i.e., based on proprietary engineering and to a lesser degree protocols), and only partially open. In contrast, cybernetworks are typically non-hierarchical, transparent, and based on open architectures. After a brief period of limited interoperability and multiple protocols, attempts were undertaken to create the prerequisites for seamless networks, most prominently applied in the Internet (Hafner & Lyon, 1996).

In the next section of this thinkpiece we briefly review the main conceptual bases of the current regulatory regimes and their weaknesses and strengths as a blueprint for the future evolution of telecommunications networks and services. Although a broader scope would be desirable, we limit our arguments to the industrialized countries joined in the OECD. Section three develops some generic principles that may be better suited for the dynamic environment of telecommunications. Section four discusses the issue of feasible reforms and their institutional implementation at the different levels of social organization. We present our main conclusions in section five.

2. The transformation of regulation

Telecommunications regulation in what we today term the industrialized countries emerged as a pragmatic response to the challenges posed by new technologies (telegraph, telephone, radio) within unique historic, political, and cultural circumstances that defined (and limited) the set of feasible policies. For instance, while there were serious arguments in favor of government ownership of telecommunications at around the turn of the century in the United States, such a policy was clearly out of the range of feasible models. To the contrary, government ownership became the major approach outside of North America until the recent reforms began in the 1980s. Despite these different approaches to ownership as well as institutional implementation, each of the models constituted a unique mode of “regulation” of the industry. As the word “regulation” was and is not used uniformly in different national debates a few comments seem justified.

Arguably the most narrow interpretation of the role of regulation developed in the U.S. Regulation was seen as a set of sector-specific rules developed and enforced by dedicated agencies, such as the Federal Communications Commission (FCC) or state public utility commissions (PUCs). According to Supreme Court interpretation the U.S. constitution requires that actions of these agencies need to be based in a legal mandate. Despite the fact that regulatory agencies became hybrid organizations, combining legislative, executive, and judicial functions, regulation was thus distinguished from legislation. It was, further, distinguished from more generic rules, such as the constitution or antitrust laws, that apply to all sectors of the economy but also from more discretionary interventions such as industrial policy. While in the early days of regulation it was seen by some as an instrument of social transformation, it was generally perceived more narrowly as a *substitute* for competition in situations where markets fail to perform their functions well. Regulation was and is perceived an opposite of market

forces and as an interference in the working of unfettered markets only tolerated if justified in the public interest.¹

In the context of state-owned telecommunications monopolies, regulatory functions were generally more dispersed and less transparent. Frequently, the operator of telecommunications services was also entrusted with main regulatory functions, such as the licensing of other service providers or the setting of standards. Prices were usually set by the legislature. The intellectual background for these arrangements was provided by schools of thought, such as the “theory of the socio-economy,” that saw a major function of government in the active promotion of welfare and national growth.² Infrastructure and public works projects were seen as a main instrument of the government to achieve these goals and the state-owned providers of telecommunications services expected to play a major role in this process. Telecommunications policy thus did not assume the restrictive, adversary nature of North American regulation but evolved as a more cooperative approach. As a result, the entrenched state monopolies and the aligned vested interest groups, such as trade unions or industry groups, became major obstacles to a pro-competitive transformation of the industry. As more liberal market conditions are being instituted, the role of regulation is changed towards a more transparent system. However, it remains more embedded into an overall government policy towards telecommunications although it gradually also assumes aspects of the more antagonistic character of US regulation.

In both frameworks, telecommunications policy was differentiated according to industry segment with differing rules for telephony, cable television, broadcasting, and often wireless. Telephony and cable were regulated based on questionable natural monopoly arguments whereas broadcasting was regulated based on the questionable grounds of the scarcity of the electromagnetic frequency spectrum and often merit good arguments of the services provided by

¹ The different schools differ in their interpretation of what facts constitute market failure. The broader institutional tradition has a rather inclusive approach and is generally skeptical as to the workability of competition in telecommunications and includes distributional objectives as a legitimate goal of regulation (see, for instance, Trebing, 1995). The neoclassical school has a rather narrow view of market failure and tends to take a stance in favor of competition (for the burgeoning literature see Kahn, 1988; Spulber, 1989; or Laffont & Tirole, 1992).
² For an accessible interpretation see Thiemeyer (1983).

broadcasters.³ Wireless services, cable, and emerging computer networks were typically regulated according to some hybrid rules. Moreover, market entry into these areas was in many countries liberalized relatively early in the process of overall reform, yielding a patchwork of approaches and differential treatment with respect to the regulation of market entry, prices, other aspects of conduct, content, and so forth. There is a danger that this differential treatment and the resulting asymmetries will lead to distortions in the evolution of a more open network of networks and we will come back to this point in the next section.

The past and currently existing regulatory frameworks have two major shortcomings. First, the basic premise that regulation is a substitute of competition and thus can and should be phased out whenever competition is workable ignores the point, that market processes themselves need an institutional framework to function properly. That is, markets are socially constructed and the way property rights are assigned, disputes are being solved, and business agreements are being reached, to name but a few, can make vital differences for the efficiency and distributional characteristics of arrangements. From such a broader perspective it needs to be decided what institutional arrangements need to be in place to evoke the desired sector performance and how it should be implemented. Functionally, this is equivalent to the design of a set of rules and regulations (even if they may be implemented via legislative tools). Second, regulatory theory and practice is rooted in concepts of static economic analysis. That is, it is modeled based on rather strict assumptions of given technology, well-defined market equilibria, well-defined and given consumer preferences, and so forth. In the world of rapidly changing technology and largely unknown consumer behavior such models may be very misleading and provide little guidance as to the institutional framework required for the most beneficial development of the industry.

3. Principles of cyberregulation

³ The merit good argument (although infrequently used explicitly) states that the preferences of individuals for certain goods (e.g., violence, educational content) are distorted and that a paternalistic intervention by the government may be needed to correct for that distortion. An analogous argument is used (and more widely accepted) to legitimize mandatory vaccination or mandatory education.

Before we can develop some of the guiding principles of cyberregulation in more detail it seems helpful to classify the different activities that take place via advanced networks. Originally, the functions of telecommunications networks could be distinguished into interactive services (telephony) and one-to-many communications (broadcasting). Cable television, satellite communications, and terrestrial wireless communications were fit into this framework, often as hybrids subject to one set of rules or the other, depending on the service provided.⁴ Things became more complicated as audiotex services became more popular, online services expanded rapidly, and cable companies started to provide Internet access services. The U.S. Telecommunications Act of 1996 has provided a partial homogenization of rules although it has stopped far short from providing an integrated set of regulations for providers of advanced telecommunications services independent of the underlying technological basis.⁵ Likewise, in most other countries, rules and regulations are still based on the separate industry model outlines above.

The resulting regulatory approaches are to a large degree facilities-oriented. In addition, they are spatial in nature with tasks assigned to specific geographically defined jurisdictions. A large amount of the broader telecommunications policy debate, for instance the National Information Infrastructure (NII) discussion also emphasizes the facilities aspect of communications networks. In contrast, many of the developments in cybercommunications are characterized by a decreasing importance of the physical network layers and of physical space. Facilities become but one component in the value-added chain of providing services and applications. Applications such as voice mail, e-mail, usegroups, virtual storefronts, and so forth create permanence in cyberspace. Virtual reality applications create a new form of physical experience. They are to a large degree independent of spatial constraints and may thus not fit well into a regulatory model with a strong spatial and jurisdictional structure.

⁴ For instance, in the U.S. prior to 1993, paging services were regulated according to radio regulations even if they provided interactive service, whereas cellular companies were regulated according to common carrier regulations. DBS is regulated according to broadcasting rules if unscrambled but regulated more like a private contract carrier if scrambled.

⁵ For instance, commercial mobile radio service providers (CMRS) are treated significantly different than other network-based service providers.

To cope with these challenges it may be useful to differentiate networks, services, and applications based on them into their constituent parts. Such an approach may help disaggregate regulatory tasks and functions. A model that has been promoted both in theory and guided regulatory practice is the differentiation between facilities and services. This approach is underlying the gradual liberalization model pursued by the U.S. and many other countries that has first opened market access in the area of services but restrained full facilities-based competition. It has more recently become a blueprint for state regulatory policy, for example in the Rochester Plan approved in New York state, which disaggregates network facilities (which remain under regulatory supervision) and services (which were opened to full competition). Latzer (forthcoming) has proposed a vertically and horizontally disaggregated model. Horizontally, he differentiates telecommunications, broadcasting, and cable television whereas vertically he proposes to differentiate content, services (such as voice or data service that provide the platform for content), distribution facilities, and terminal equipment. From this vantage point, a regulatory framework may have to be differentiated based on these “layers.”

In differentiating the various modes of communications mediated via advanced communications networks, Bordewijk & Kaam (1986) create a typology based on the two dimensions of control over the supply of information and control over the consumption of information. This approach yields four modes of communication depending on whether control over supply and consumption are centralized or decentralized. *Distribution* (“allocation”) is a process where information flows from one to many and corresponds to the traditional mass media paradigm. *Conversation* is either a one-to-one or a few-to-few process of communication. *Registration* involves an individual act of information retrieval from an individual source (e.g., information gathering via online services). *Consultation* are communication processes in which many supply information to an individual (e.g., listservers). Latzer (forthcoming) hypothesizes that the process of convergence will gradually substitute conversation and consultation processes for distribution processes. Samarajiva (1996) has suggested to use the electronic marketplace metaphor as a basis for designing an appropriate regulatory framework for cybercommunications. The model of the marketplace and its rules become guidelines for addressing such issues as privacy, content, and numbering administration. An alternative structure that may help shaping the required

regulatory framework is to differentiate the types of processes mediated via communications networks and services. These are *transportation* functions (“electronic cargo”), *transaction* functions (e.g., electronic commerce), *access* to information, and *meeting place* functions (individual, group).

The problem of such categorizations is that while they help structuring the discussion they do not provide a normative basis as to what regulations should be put into place. Such normative frameworks can be either *substantive* or they can be *procedural* or a mix of both. The first approach is represented, for instance, by the normative interpretation of the model of welfare economics or the reliance on normative principles of law. The second approach is represented by a political model based in accepted rules of discourse that lead to fair and accepted policies (Rawls, 1981; Habermas, 1996). Besides such explicit rules, regulation will generally be influenced by non-formal rules, such as moral concepts, value systems and so forth. Thus, the position of the individual versus the community, the discretion of owners of resources over their use, or the legitimacy of privately negotiated or publicly settled agreements may prove major contested issues that cannot be understood nor solved without reference to this non-formal framework. One of the main challenges for the design of a proper framework for cybercommunications is to find the most suitable mix of these approaches.

4. Traditional and new tasks of regulation

Given the dynamics of technological evolution in cybercommunications, it seems to us that such a model should provide sufficient room for learning processes and the evolution of networks, services, and applications. As networks, services, and applications evolve gradually over time, complicated issues related to advantages of incumbency need to be solved. Unlike in the past, where market power was typically vested in the exclusive control over facilities and monopoly provision of services, market power in the new framework is more likely to be based market dominance through vertical and horizontal integration across facilities, services, and content. Although from an evolutionary perspective a relaxation of past cross-ownership rules seems

desirable, there are clear trade-offs and dangers of sustained dominance by large incumbent providers. Such market power may be supported by proprietary software and protocols needed to operate the network and services (Mansell, 1993). As the mix of common carriage and contract carriage changes, market power based in the control over facilities may re-emerge unless a geodesic network structure will prevail over more hierarchical structures. These forms of market power are much more difficult to control than traditional monopolies and the instruments of regulation are not well suited to cope with the issue. For instance, the reliance of price caps may support rather than prohibit tacit forms of collusion between major players in the industry. To avoid problems associated with market power, strict enforcement of antitrust rules will be required (although the history of US antitrust enforcement is dismal and gives little reason to hope for success). As many countries outside of the US do not have elaborate antitrust laws, a great need for institutional development exists.

A second main area touches upon the question of whether an appropriate framework should be homogenous and symmetric. Homogeneity of the regulatory framework could be achieved via a full integration of the rules into a multimedia legal and institutional framework. Such an approach would avoid the differential treatment of, for instance, over-the-air broadcasting, cable television, and other forms of network-based delivery and, therefore, reduce the potential welfare losses from such a differentiation. On the other hand, such integration does not come without costs. Substantial transaction costs likely need to be incurred to develop such a framework. Moreover, such homogenous treatment may reduce the scope for experimentation with different delivery technologies and thus decelerate the speed of technological innovation. An probably more feasible alternative to such a sweeping integration would be the elimination of rules that treat functionally similar services in a different fashion depending on the delivery technology, unless there are significant reasons for such a differentiation. Such a model would approach services and applications in a more or less technologically neutral fashion but maintain differentiation where justified (for instance, rely on different market entry rules such as for wireless and wirebased carriers). The definition of services could rely on economic criteria, such as the degree of substitutability.

A related issue is that of the symmetry of the regulatory framework for (1) incumbent service providers and new market entrants and (2) between the different segments of the industry. Asymmetric regulation is often related to the different potential of players to abuse their market position against consumers and/or competitors. Advantages of incumbents may include the control of bottleneck facilities, an installed network base, an established customer basis, or a recognized brand name. Based on such factors, for example, price regulation has been imposed on dominant carriers but not on others, line-of-business restrictions have been imposed on the RBOCs but to a much lesser degree on other carriers, and universal service funding obligations are borne by a subset of all service providers. Not infrequently, such asymmetric provisions are also rationalized with infant industry arguments, that is, the need for new market entrants to enjoy temporary protection from full forces of competition to be able to reach a critical mass of market penetration. Asymmetric regulation may result in serious distortions of competitive processes and, in general, a symmetric framework would be desirable. Often, such a framework can be achieved via institutional design measures. For instance, an abuse of bottleneck facilities can be eliminated with open access and imputation rules; universal service funding obligations could be based on a competitively neutral mechanism, such as a value-added tax; the abuse of transfer pricing and cross-subsidization between competitive and non-competitive markets can be reduced through forms of price review or structural separation requirements. Similar arguments hold with respect to the symmetry of conditions between different telecommunications networks.

As the variety and complexity of uses of telecommunications networks increases, increased attention needs to be based on issues related to the security of transactions, the protection of privacy and copyright, as well as content. Although a vast body of law is applicable also to cybercommunications (see Rose, 1995), important issues remain to be solved. For instance, the creation of messages may be critically dependent on solutions to the copyright issues. Likewise, the usage of cybernetworks for electronic commerce between unaffiliated individuals and/or organizations may be critically dependent on a set of established and proven legal and security provisions. Probably the most contested issue is the question of content regulation. Solutions to this issue are even more dependent on the non-formal institutional infrastructure (values, morale, ect.) of a society than issues related to the rather well-understood market structure problems.

While such non-formal institutions and codes of conduct exist in cybernetworks, the dynamic of their development poses a major challenge to the generally slow emergence of such sets of rules. Therefore, it seems a legitimate question whether or not the government or some other institution ought to set content rules (see the presentation by Samarajiva).

The emergence of cybernetworks also raises important equity issues. These are related to but not identical with the universal service question. Electronic information creation, dissemination, storage, and so forth is already changing ways of learning, work, and many other aspects of life. Information is commercialized and de-commercialized and the access conditions to information determine the opportunities of individuals and organizations. There are fundamental tensions and incompatibilities between this public resource character of cybernetworks and their predominantly commercial market organization. Some of these features are modifications of well-known examples of market failure. For instance, there is an inherent trade-off between equity and efficiency in market-driven environments. Market forces will deploy technologies and services to those areas and customers that promise the highest profitability unless explicit measures to counteract these trends will be adopted. The need to significantly upgrade cybernetworks calls for some form of a congestion charge that reflects the capacity expansion costs of the network. Such pricing may be in conflict with the goal of equitable, non-discriminatory access.⁶ These issues reach well beyond a narrow interpretation of regulation and need to be solved at a more general societal level.

As cybernetworks and telecommunications carriers increasingly reach beyond national boundaries, many of the issues become supra-national in scope (see Bauer, 1996; Bauer & Besancon, 1996; Bauer & Yoo, 1996). Significant obstacles exist that restrict a free flow of resources across international borders. Besides the mentioned asymmetric market access conditions these include continuing serious ownership regulations. As a result, many carriers and service providers pursue multi-national investment strategies or attempt to achieve global reach via alliances and joint ventures. As ownership restrictions are only poorly justified and

⁶ A similar argument was made in earlier days of the telephone industry for averaged and relatively uniform rates. In this case the incompatibility of competition and averaged rates is evident.

thus will probably disappear gradually, a mismatch between the powers of national institutions and the international mobility of capital and resources may emerge. In such a scenario, cyberregulation will more likely be driven by commercial processes than be in control of such processes. The international community thus faces the challenge to create a more coherent framework of rules than the currently existing one represented by the International Telecommunication Union (ITU), the World Trade Organization (WTO), UNESCO, other standard-setting organizations, or regional organizations such as the European Union or ASEAN. It also seems that the current model of intergovernmental arrangements may need to be replaced by a delegation of powers to an international agency.

A related issue is the institutional implementation of the regulatory framework for cyberregulation. This is particularly relevant for the assignment of tasks to voluntary communities, formal institutions of the government (local, state, federal), and the solution of the international tasks. Little normative thinking exists as to the optimal assignment of tasks. The economic theory of federalism, for instance, proposes to assign tasks to the level of institution that can conduct certain tasks most efficiently. This would require a match between the task at hand and the hierarchical level of an agency. Political pragmatism has coined competing principles. The subsidiarity principle would assign tasks as closely as possible to individual citizens (or their local/state/national governments, respectively) unless a higher level or organization is required to perform the task effectively. Likewise based on pragmatism, the U.S. constitution with its division of labor between the states and the federal government that is often based in the delineation of intra-state versus inter-state commerce provides yet another organizing principle. The choice between one method or another will, once again, be heavily influenced by the specific non-formal institutions of a society and polity.

5. Conclusions

This brief thinkpiece has tried to outline some of the core issues of regulating cybernetworks. One conclusion is that the continued fragmented regulatory approach seems to have more

disadvantages than advantages. However, how an alternative approach will look like is very dependent on the specific formal and non-formal institutions of a society. Given the fast speed of change in the industry and thus the necessity of learning, a framework that provides most room for these experiments and evolutionary processes, seems most appropriate. Such a framework needs more regulatory rules than just maximum competition. For one, competition itself is conditioned on the existence of regulatory rules. More importantly though, many issues will remain that can only be solved collectively, They include access issues, pricing issues, and the development of content rules and supporting legal mechanisms.

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