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From Static to Dynamic Regulation

Recent Developments in US Telecommunications Policy

One of the most important present challenges faced by communication regulators is the creation of conditions that facilitate the high capital investment required to deploy next-generation networks capable of supporting continued innovation in new applications and services. This dynamic regulation problem is qualitatively different from orchestrating the transition from monopoly to an open market environment that had occupied regulation since the start of reforms several decades ago. During that earlier regulatory cycle, most of the core network infrastructure was already in place. Hence, many regulators attempted to jump-start competition with forms of structural and conduct regulation at the wholesale level, including divestiture, interconnection, unbundling, and wholesale price regulation. In contrast, the deployment of next-generation networks requires significant upgrades and investment in new networks. Conditions for this massive expansion are complicated by the turbulent competitive environment. Digitalization allows the market entry of new powerful competitors, even if they initially only serve niche consumers. It also facilitates the migration of content and services across different platforms, stimulating new forms of competition. For example, mobile services substitute for fixed phones. Instant messaging and social networking sites may, in turn, serve as substitutes for mobile and fixed communications. On the other hand, new complementarities also emerge, as advanced network platforms will only be subscribed to if sufficient content and applications are available.

During the past several years, US telecommunications regulators, partly on their own initiative and partly in response to mandates by the courts, have adopted a bold pro-competitive stance. Ex ante regulation has been removed or significantly curtailed even in situations that would not have passed muster in the recent past (or would currently pass the competitive test elsewhere). This shift has several causes, including the new industry environment and new patterns of competition. It also reflects a re-conceptualization of the basic pillars of regulatory practice: the gradual – and often tacit – replacement of a static with a dynamic approach to designing regulation. We argue that this transformation has been underway for quite some time, at least at the level of the conceptual frameworks that inform practical regulation, but that it has now started to influence actual policy. A critical appraisal of this change sheds light on an important regulatory development and may be useful for other nations as they design their response to the emerging communications environment.

In a broad-brush overview, it is possible to distinguish three distinct approaches to dealing with innovation and investment. In actual practice, these prototypes often coexisted for different segments of the communications industries. We propose the term "static regulation" for an approach that formulates the policy problem as one of controlling market power subject to given technological and economic constraints. What we call "comparative static regulation" takes technical change into account and asks how regulatory instruments need to be adapted to such developments. However, investment and innovation continue to be treated in an equilibrium framework. In contrast, "dynamic regulation", the focus of this paper, recognizes the generation of proper incentives for investment and innovation – both dynamic economic phenomena – as a core challenge for the design of a regulatory framework. It acknowledges the inherent uncertainty of the new environment and conceptualizes investment and particularly innovation as a response by entrepreneurs and firms to market opportunities (and hence as a disequilibrium phenomenon). In contrast to full reliance on antitrust and competition law, dynamic regulation attempts to deliberately shape market rules in ways that are perceived as most

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conducive to the prevailing overarching public policy objectives for the communication industries. In the historical evolution of US telecommunications regulation, each of these frameworks was most influential during certain time periods with the others playing less important roles. The static perspective was the predominant approach until the 1970s. From the onset of gradual deregulation in the 1970s until the late 1990s regulation was more strongly shaped by the comparative static approach. Presently, regulation is in another transition to a dynamic approach, relegating the other perspectives to a less prominent role.

This paper describes, and critically comments on, this transformation of the theoretical underpinnings of practical regulation in the US and assesses its relevance for other nations and regions. It first provides a brief historical review as to how investment and innovation issues were addressed by US regulation during the three paradigmatic periods. It then discusses elements of the conceptual frameworks used in formulating a more dynamic framework. This is followed by a discussion of US unbundling policy and policies toward next-generation networks, cases that illustrate the transformation toward dynamic regulation particularly well. The design of regulatory policy under uncertainty is then addressed. In conclusion, first lessons for other countries are drawn.

The Evolution of Dynamic Aspects of Regulation

It was not until the 1960s and 1970s that the intertemporal aspects of regulation became a more central concern of researchers and practitioners. This is not to say that regulation had ignored investment and innovation during preceding periods. In fact, core regulatory policies were designed to balance the need for massive infrastructure roll-out with mitigating undesirable effects of market power. Rate-base rate-of-return (ROR) regulation was explicitly designed as a tool facilitating large-scale investment. Technical change and investment problems were not ignored in this approach but they were considered as part of the long-term planning processes upon which regulation was based. For example, to have capital expenses acknowledged as part of the regulated rate base, firms had to demonstrate that these investments were used and useful.[1] The notion that due to economies of scale telephone suppliers were natural monopolies was nearly uncontested. Regulatory practice sought to mimic the outcomes of a competitive market. Given the natural monopoly assumption, this implied the second-best solution of equating prices to average costs. Joseph Schumpeter pointed out in the 1940s that regulatory theory was built on the (in his view flawed) assumption of a static or a steady-state market situation.[2] In his view, this was the wrong efficiency standard given the fact that technical change and innovation were the main engines of growth in capitalist economies.[3]

The work of Harvey Averch and Leland Johnson marks the beginning of more formal attempts to examine the effects of regulation on investment (and later on innovation).[4] One of the findings emanating from this research was that ROR created a systematic bias in favor of wasteful capital expenses ("gold plating"). Although the theoretical findings were never supported by strong empirical evidence, the claims influenced the subsequent policy debate. At a practical level, very gradually during the 1960s and with increasing vigor during the 1970s, US regulation started to circumscribe the realm of regulation more narrowly to create a competitive fringe that would stimulate innovation and experimentation in market segments outside the core of the natural monopoly. Successively, terminal equipment, value-added services, long distance, satellites, mobile service, cable TV, and eventually local services were freed from cumbersome regulation.[5] Whereas in the preceding periods the potentially wasteful investment under ROR regulation was at the center of attention, during the late 1980s and 1990s the US was, in contrast, again worried about insufficient investment in telecommunications infrastructure.[6] However, the solution was now seen in more competition and in new forms of regulation rather than in a return to traditional regulatory methods. Consequently, price cap regula-

[1] Cf. C. F. Phillips, Jr.: The economics of regulation: theory and practice in the transportation and public utility industries, Homewood, IL, 1965, Irwin.

[2] Schumpeter was not unsympathetic to the problems of regulation. Under his presidency of the American Economic Association, one of its oldest subgroups, the Transportation and Public Utilities Group (TPUG) was founded. However, he was very outspoken in his critique of the prevailing regulatory practice and its theoretical foundations.

[3] Cf. J. M. Bauer: Market power, technical change and efficiency in telecommunications: Schumpeter reconsidered, in: Journal of Economic Issues, Vol. 31, No. 2, 1997, pp. 557-565.

[4] Cf. H. Averch, L. L. Johnson: Behavior of the firm under regulatory constraint, in: American Economic Review, Vol. 52, No. 5, 1962, pp. 1052-1069 and, with an emphasis on innovation, E. E. Bailey: Innovation and regulation, in: Journal of Public Economics, Vol. 3, No. 3, 1974, pp. 285-295.

[5] The history of these reforms is well documented. Cf. G. W. Brock: The telecommunications industry: the dynamics of market structure, Cambridge, MA, 1981, Harvard University Press; G. W. Brock: Telecommunication policy for the information age: from monopoly to competition, Cambridge, MA, 1994, Harvard University Press; and G. W. Brock: The second information revolution, Cambridge, MA, 2003, Harvard University Press.

[6] Cf. National Telecommunications and Information Administration (NTIA): The NTIA infrastructure report: telecommunications in the age of information, Washington, DC, 1991, US Department of Commerce.

tion was adopted with the expectation that it would better than ROR regulation reconcile control of market power with incentives for investment and innovation. The Telecommunications Act of 1996 was designed to facilitate competition in local markets, the last remaining monopoly area, and to accelerate competition in the telecommunications industry in general. It set the stage for the latest shift toward dynamic regulation.

Regulatory measures before the 1990s were largely based on a static or comparative static model of competition. From the late 1990s onward, with competition taking hold in an increasing number of market segments, regulatory measures shifted from retail to wholesale markets. At the same time, regulators became more informed by dynamic models of competition. Since the 1970s, US policy had been gradually inspired by creating a regulatory framework that would allow competition to unfold more freely. State and federal regulators, who jointly have jurisdiction over the common carrier segments of the telecommunications industry, pursued a strategy of structural separation. Market segments with economic and technological conditions that presumably allowed workable competition were removed from regulatory oversight. In the remaining regulated areas, the agencies set prices and other conditions attempting to mimic the outcomes of competitive markets. Even if not explicitly stated, the reference model guiding price regulation, the delineation of structurally competitive and non-competitive markets, as well as other regulatory decisions was a perfectly competitive market.[7] This is visible in the classical texts guiding regulation[8] and in more recent treatises.[9] Dynamic effects of regulation, at least at the level of the individual firm, were not at the center of public policy debates. This was less critical as the technological basis of the regulated telephone industry was, until recently, relatively stable.[10] Major innovations at that time occurred predominantly in the unregulated parts of the industry.

When early liberalisation and digitalisation started to accelerate change, the innovation potential in core segments of the infrastructure increased and significant investment needs in next-generation networks arose. It became increasingly clear that the traditional competitive model was a mismatch to the emerging industry environment, which was characterised by higher degrees of risk and uncertainty. Without proper models to guide the design of regulatory policy in this new environment, traditional regulation was increasingly seen as an impediment to innovation. Price cap regulation quickly lost its appeal, as unexpected weaknesses were revealed.[11] Consequently, Section 509 of the Telecommunications Act of 1996 expressed a clear desire to let advanced communication infrastructure develop in an environment "unfettered from state and federal regulation". However, the Act sent mixed signals to regulators and industry, as some of the instruments envisioned to support the transition to local competition invited excessive forms of regulation. Driven by a continued focus on perfect competition, stringent unbundling policies were promulgated for voice services and later for broadband DSL platforms (a more detailed discussion is presented further below). The experience with the specific local loop unbundling model adopted in the US revealed the trade-off between its effects on short-run service-based versus long-run facilities-based investment. As a consequence, the weaknesses of the static approach to regulation were more clearly recognised. Alternative conceptual frameworks that had influenced regulation on the fringe in prior decades were revitalized and became adopted into the mainstream of regulatory design.The lessons from voice unbundling were extrapolated to broadband networks and contributed to the shift toward dynamic regulation in these markets.[12]

Revisiting Concepts of Competition in Telecommunications

At the heart of these changes was a shifting emphasis on different notions of "competition" away from

[7] Cf. the similar argument (although made in a narrower context) by W. J. Baumol: Regulation misled by misread theory: perfect competition and competition-imposed price discrimination, Washington, DC, 2006, AEI-Brookings Joint Center for Regulatory Studies.

[8] Cf. M. J. Glaeser: Outlines of public utility economics, New York 1927, Macmillan; M. J. Glaeser: Public utilities in American capitalism, New York 1957, Macmillan; C. F. Phillips, Jr.: The Economics of Regulation: Theory and Practice in the Transportation and Public Utility Industries, Homewood, IL 1965, Irwin; and A. E. Kahn: The economics of regulation: principles and institutions, New York 1970/71,Wiley.

[9] Cf. D. F. Spulber: Regulation and markets, Cambridge, MA, 1989, MIT Press; K. E. Train: Optimal regulation: the economic theory of natural monopoly, Cambridge, MA 1991, MIT Press; and J. J. Laffont, J. Tirole: Competition in telecommunications, Cambridge, MA 2000, MIT Press.

[10] This raises the question of whether technological change was slow because of monopoly regulation or vice versa. If technological change is endogenous to the regulatory system, as much of the recent dynamic literature would claim, the former seems more likely.

[11] Cf. D. E. M. Sappington, D. Weisman: Designing incentive regulation for the telecommunications industry, Cambridge, MA 1996, Washington, DC, MIT Press, AEI Press; and C. Ai, D. E. M. Sappington: The impact of state incentive regulation on the U.S. telecommunications industry, in: Journal of Regulatory Economics, Vol. 22, No. 2, 2002, pp. 133-159.

[12] Cf. J. M. Bauer: From static efficiency to innovation focus: the turnaround of U.S. unbundling policy, in: P. Baake, B. Preissl (eds.): Unbundling policies in the OECD, Berlin, 2006, Deutsches Institut für Wirtschaftsforschung, pp. 150-175.

the traditional emphasis on the outcomes of atomistic markets. Echoing earlier contributions, some dating back to the mid-nineteenth century, newer theoretical perspectives insinuate that the traditional, perfect competition model is not useful as a benchmark for regulatory policy. In contrast, market concentration and temporary dominance may, under certain circumstances, be even conducive to dynamic economic efficiency. In addition to the early works on dynamic market processes, recent research on competition in the presence of sunk costs, the economics of networks, and new perspectives on vertical and horizontal relations are of particular interest.

One strand of thinking that was revitalized addresses the possible conflict between the conditions that are most conducive to static efficiency and those that facilitate dynamic efficiency. These themes date back to the work of J. A. Schumpeter, who coined the colorful notion of competition as a process of "creative destruction" and the later work by J. M. Clark on"workable" competition.[13] In a static context, that is, when supply and demand conditions are stable and predictable, the widely known model of perfect competition can serve as a yardstick for the design of policy. However, to stimulate dynamic efficiency, that is, risky investment and innovation, these authors argued that the conditions of static efficiency have to be violated, at least temporarily. Obstacles to competition, such as barriers to entry and the associated ability to charge prices above cost, have a role to play in facilitating long-term efficiency. Dynamic efficiency is promoted by entrepreneurs that seek super-normal profits by introducing innovative forms of production, goods and services. Although Schumpeterian analysis provided a powerful new lens on entrepreneurship and dynamic competition, it did not influence public policy for several decades. Schumpeter focused on revolutionary innovations, but other authors emphasized the equally important role of entrepreneurs in recognizing opportunities for incremental innovation.[14] In either case entrepreneurs innovate because of disequilibrium situations in a market. Apart from the eloquent mathematical treatment of these issues by C. C. von Weizsäcker,[15] no general formal model of competition and entrepreneurship is presently available to guide specific regulatory policy. Recent changes in regulatory policy are therefore based on broader policy visions.

Whereas these earlier theoretical strands envisioned dynamic competition as a disequilibrium process, other approaches rooted in more traditional neoclassical analysis also shifted the perspective away from the yardstick of perfect competition. The theory of contestable markets, developed in the 1970s, has moved attention away from actual market structures and market shares, which were the focus of classical antitrust analysis, to the entry and exit conditions of a market.[16] If market entry and exit are very easy ("ultra-free"), market concentration does not matter and even a monopolist could not abuse its power. Since it is the abuse of market power, not its mere existence that is critical in US antitrust cases, the theory has strong potential implications for mergers. Although telecommunication markets rarely meet the criteria necessary for these strong assumptions and the associated efficiency results to hold,[17] contestability theory has contributed to a stronger focus on sunk cost and other barriers to entry. There is a widespread presumption that the evolution of telecommunications markets, in particular the emergence of inter-modal competition and the emerging class of access-independent services provided on a next-generation network architecture, has reduced or even eliminated market entry barriers and hence increased the degree of contestability.[18] As a result, high degrees of market concentration are often regarded as benign if accompanied by low market entry barriers or other conditions that preserve workable contestability.

One important aspect of telecommunications is the high sunk cost of building a network. This includes the traditional sunk costs, that is, the part of the initial expenses that cannot be recovered in case of exit. Furthermore, as the theory of real options has clarified, under conditions of uncertainty, the opportunity cost to an investor of losing the option to wait until more information about the future development of markets becomes available, is an additional sunk cost.[19] In the presence of fixed costs, some of which sunk, firms

[13] Cf. J. M. Clark: Competition as a dynamic process, Washington, DC 1961, Brookings Institution; J. A. Schumpeter: Capitalism, socialism, and democracy, New York 1942, Harper.

[14] Cf. I. Kirzner: Competition and entrepreneurship, Chicago, IL 1973, The University of Chicago Press; S. Shane: A general theory of entrepreneurship: the individual-opportunity nexus, Cheltenham, UK and Northampton, MA 2003, Edward Elgar.

[15] Cf. C. C. von Weizsäcker: Barriers to entry: a theoretical treatment, Berlin 1980, Springer.

[16] Cf. W. J. Baumol, J. C. Panzar, R. D. Willig: Contestable markets and the theory of industry structure, New York 1982, Harcourt Brace Jovanovich.

[17] Cf. W. G. Shepherd: "Contestability" vs. competition, in: American Economic Review, Vol. 63, No. 2, 1984, pp. 98-105.

[18] Cf. D. J. Teece, M. Coleman: The meaning of monopoly: antitrust analysis in high-technology industries, in: Antitrust Bulletin, Vol. 43, No. 3-4, 1998, pp. 801-857.

[19] Cf. A. K. Dixit, R. S. Pindyck: Investment under uncertainty, Princeton, NJ 1994, Princeton University Press.

will need to differentiate their prices and charge prices above incremental costs in order to meet their dynamic break-even constraints. It is important to understand the different implications of this break-even constraint for past and future investment. Past investment is already irretrievably sunk. Whereas a firm will attempt to recover these costs, it may be forced by competition to price its services as low as its incremental costs. However, in the process of planning an investment, a rational firm will only go ahead with a project if it anticipates that the overall revenues during the life-span of the project will be sufficient to recover the sunk costs in addition to other costs. Hence, a firm must be able to charge prices, sometimes significantly, above incremental costs, to meet this dynamic break-even constraint. If the anticipated competitive conditions do not allow such recovery, the firm will decide against the investment project. Like Schumpeterian analysis, the theory of real options questions the yardstick proposed by static models of competition to assess the effectiveness of competition (i.e., setting prices equal to marginal or incremental cost). To the contrary, deviations from incremental cost prices are a precondition to dynamic efficiency. Firms in network markets will use a range of strategies to meet their dynamic break-even constraint, including price differentiation and bundling of services.

A third area of research that has contributed in important ways is the economics of networks and its application to antitrust and competition issues. This relatively young field of economic research studies the unique economic conditions of network industries. These deviate in several ways from the standard textbook models of industrial organisation.[20] Most importantly, network industries often operate under increasing rather than diminishing returns to scale and use shared capital to provide their services. Cost concepts such as average cost or incremental costs are difficult to define in networks. Moreover, network industries often are characterised by a combination of high fixed/sunk and low incremental costs. Consequently, traditional optimality conditions, such as equating incremental costs with incremental revenues, cannot be operationalised easily. Other important features of network industries include the existence of network effects and possibly network externalities,[21] the existence of strong complementarities between components of the network (e.g., terminals and services) or between layers of services that need to be combined to offer a final service (e.g., transportation services and content). Network effects and the inability to measure incremental costs are additional features that render traditional efficiency standards that equate incremental costs and incremental revenues inappropriate.

A final area that has received renewed attention is the ability of a firm to foreclose vertically related markets and its capacity to leverage market power from one market segment to a complementary one. As next-generation network architectures are envisioned that will separate network infrastructure from transportation and applications more clearly, this is a particularly relevant issue. Modern telecommunication services require the combination of several complementary services, including transportation, routing, applications, and content. Traditional theory assumed that firms with market power in one market segment would have a strong incentive to expand this influence to vertically related and complementary market segments. This view was historically challenged by the Chicago School of economics, which claimed that market power was almost always rooted in superior efficiency. A modified version of the approach claims that the owner of a network platform does have an interest in the efficient provision of complementary services, such as content and applications. Therefore, unless it can provide these complementary services more efficiently than any other firm, it will not expand and distort complementary markets as this will also reduce profits in the platform segment. For the same reason, even a dominant firm in the platform market will not leverage its market power to a complementary market. There are many possible objections and exemptions to this general rule. Farrell and Weiser discuss eight such exceptions, including regulation of a platform owner, price differentiation, myopic behavior of the incumbent firm, and weak complimentarity.[22]

These developments have not altered the process of competition review and antitrust scrutiny in principle. However, they have affected the criteria used when

[20] For introductions to the general literature cf. O. Shy: The economics of network industries, Cambridge, UK 2001, Cambridge University Press, and H. W. Gottinger: Economies of networks, London 2003, Routledge. For a specific discussion of information industries cf. C. Shapiro, H. R. Varian: Information rules: a strategic guide to the network economy, Boston, MA 1999, Harvard Business School Press.

[21] Cf. S. J. Liebowitz, S. E. Margolis: Network effects, in: M. E. Cave, S. K. Majumdar, I. Vogelsang (eds.): Handbook of telecommunications economics, Amsterdam 2003, North-Holland/Elsevier, pp. 75-96.

[22] Cf. J. Farrell, P. J. Weiser: Modularity, vertical integration, and open access policies: towards a convergence of antitrust and regulation in the Internet age, in: Harvard Journal of Law and Technology, Vol. 17, No. 1, 2003, pp. 85-134.

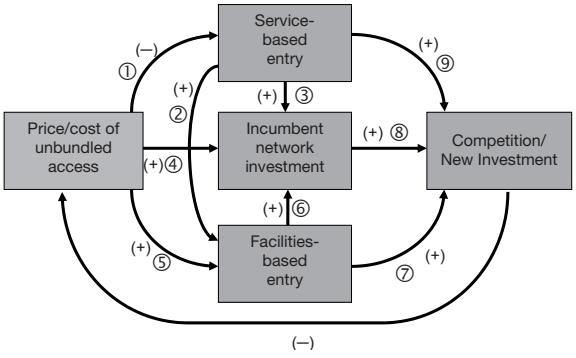
analyzing the possible effects of deregulation and industry consolidation. The next two sections briefly discuss two cases of recent regulatory change: local loop unbundling and policies toward next-generation networks.

Local Loop Unbundling

During the past few years, US unbundling policy was substantially reformulated. Whereas the initial focus was on the facilitation of rapid market entry, policy-makers have, after the slow emergence of facilities-based competition, become mainly concerned with the longer-term implications of unbundling rules for network investment and innovation. This is a remarkable turnaround from the early years of unbundling policy in the wake of the Telecommunications Act of 1996. Until their partial revocation during the past few years, US local loop unbundling rules were much more stringent and detailed than those that would later be promulgated by other countries. These favorable access conditions stimulated rapid growth of competitive local exchange carriers (CLECs), whose market share expanded to 19.1% by 2005 predominantly via service-based entry. Facilities-based entry did occur, but not as swiftly as had been envisioned when the original rules were crafted. This experience and other contested issues triggered a rethinking of the unbundling rules. A closer look at the conceptual foundations of unbundling also reveals trade-offs between its effects on short-term services versus long-term facilities-based entry that had not been fully recognized when the initial rules were put into place. US unbundling choices and their effects are compatible with these insights, which shall therefore be briefly sketched.[23]

Unbundling measures are typically based on a stage theory of the evolution of competition in local markets. The most widely accepted approach is the ladder of investment model, which states that new entrants will first enter via resale, wholesale, and unbundling (the lower "rungs" of the ladder) and once they have built a sufficient market presence will eventually invest in their own facilities.[24] Unbundling is thus an essential tool in easing initial market entry. Nonetheless, such measures require a clear justification, which is typically rooted in some form of essential facilities argument: while access to a network element/functionality is seen as necessary to compete, the specific technological and economic conditions render duplication of the network uneconomic and hence welfare-reducing. If the prices of the unbundled network elements are not set according to the right standard and/or regulators cannot commit to remove such obligations once they are obsolete, the policy may backfire and lead to a lasting bias in favor of lower-risk, service-based market entry.[25]

Figure 1
Short and Long-run Effects of Unbundling



Unbundling raises many intricate issues, including (1) how far unbundling should go, (2) how to price unbundled network elements, and (3) whether issues in the first two categories should be resolved by private negotiation, regulation, or hybrid approaches. It has complex, often contradictory effects on the incentives of the different stakeholders. Furthermore, unbundling creates multiple trade-offs and feedbacks, for example, between short-term effects on the competitive structure of a market segment and long-term effects on investment and innovation behavior. The most appropriate unbundling regime will be contingent upon the specific policy objectives and the market context. In the US, the goals of unbundling have changed over time from a narrow focus on stimulating market entry to a broader view of its implications for investment and innovation. Figure 1 illustrates the short- and long-term effects of unbundling. A "+" sign next to an arrow linking two boxes signifies that the two variables move in the same direction. For example, link ⑤ indicates

[23] For a more thorough discussion see J. M. Bauer, E. Bohlin: Recent developments in U.S. deregulation: relevance for Europe, Quello Center for Telecommunication Management and Law, Michigan State University, 2007, and J. M. Bauer: Regulation of next-generation networks, East Lansing, Michigan State University, 2008.

[24] Cf. M. E. Cave: Encouraging infrastructure investment via the ladder of investment, in: Telecommunications Policy, Vol. 30, No. 3-4, 2006, pp. 223-237.

[25] Cf. J. Hausman, J. G. Sidak: Did mandatory unbundling achieve its purpose? Empirical evidence from five countries, MIT Department of Economics, Working Paper 04-40, 2004; and J. A. Eisenach, Hal J. Singer: Irrational expectations: can a regulator credibly commit to removing unbundling obligations? Washington, DC 2007, Criterion Economics.

that a higher (lower) price/cost ratio of unbundled access will – other things being equal – increase (decrease) facilities-based entry. A "– " sign signifies that the two variables move in opposite directions. Therefore, link ① indicates that a higher (lower) price/cost ratio of unbundled access implies – other things being equal – lower (higher) service-based entry.

The overall effect of unbundling depends on the severity of the intervention (e.g., the mandated deviation of prices from the cost of providing unbundled access and the scope of unbundling requirements), the relative strength of the positive and negative effects linking the variables, and the time lags at which these effects unfold. More stringent unbundling rules (i.e., a lower price/cost ratio) will stimulate service-based entry and competition (links ① and ⑨). In turn, service-based entry will stimulate intra- as well as inter-platform facilities-based investment (link ②). Both service-based entry and facilities-based entry will indirectly spur investment by the incumbent (links ③ and ⑥). Not captured in the stylized representation is another feedback effect. Higher investment and more competition may stimulate demand for the services in question and hence induce additional service-based and facilities-based entry. This demand effect will initially be higher if stringent unbundling regulations are put into effect. In other words, a demand growth effect may counteract the substitution of services-based for facilities-based entry caused by stringent unbundling requirements. However, stringent unbundling will also have a direct negative effect on facilities-based investment by the incumbent and new entrants (links ④ and ⑤). To the contrary, less stringent unbundling rules will likely create stronger incentives for long-term investment but reduce short-term market entry opportunities. The overall net effect on competition and new investment will depend on the interaction of these forces (links ⑦,⑧ and ⑨). There is also a feedback loop from the resulting state of competition and investment back to the market for access to unbundled network elements (link ⑩) in that more intense competition will result in lower negotiated access prices. The overall effect of these interactions can only be assessed empirically. Recent empirical research for the US and the EU indicates that the substitution effect is larger than the demand growth effect. In other words, stringent unbundling regulation has a negative net effect on investment.[26]

The US experience with local loop unbundling by and large corroborates these theoretical relationships. Initial unbundling options were very advantageous to new entrants. In particular, the re-bundled UNE-P platform, consisting of local loop, switching, and interoffice transportation, allowed new competitors to enter the market without significant commitment to facilities investment. As a result, by 2004, 51 percent of competitive access lines were based on UNE-P and an additional 12 percent on UNE-L. Only 22 percent of lines were owned by the new entrants.[27] These patterns do not only hold in the aggregate but also for individual carriers.[28] The initial stringent unbundling rules had been challenged since their introduction. The additional empirical evidence and strong arguments by the courts that the FCC had not considered the implications of its policy on investment incentives, eventually led to a revocation of many of the more stringent rules.[29] Among the rules that were eliminated is the unbundling requirement for switching, which was phased out in March 2006. The Commission found that technological advances such as soft switches had rendered unbundling of switching obsolete. Furthermore, many requirements in the wholesale and special access market (mostly large enterprise customers) were defined more narrowly and differentiated according to geographic market conditions, in particular the size of the market and the number of collocating competitors.

By 2007, only the following main unbundling obligations remained in place (see Table 1 for an overview): (1) in the mass market (residential consumers and small businesses), incumbent local exchange carriers (ILECs) have to continue to make local copper loops available on an unbundled basis; (2) in the wholesale market for interoffice transportation, certain types of circuits have to be unbundled in smaller markets with insufficient competition; and (3) special access services to office buildings also have to be unbundled in smaller markets with insufficient competition. In the two latter cases, the FCC has defined thresholds for the number of competitors and the market size be-

[26] Cf. L. Waverman, M. Meschi, B. Reillier, K. Dasgupta: Access regulation and infrastructure investment in the telecommunications sector: an empirical investigation. London, Law and Economics Consulting Group with the Support of ETNO, 2007.

[27] Cf. Federal Communications Commission: Local telephone competition: status as of June 30, 2006, Washington, DC 2007.

[28] Cf. J. Hausman, J. G. Sidak, op. cit.

[29] For a more detailed discussion of the changes in US policy see J. M. Bauer: Unbundling policy in the United States: players, outcomes and effects, in: Communications & Strategies, No. 57, 2005, pp. 59-82.

Table 1
Main Elements of Present US Regulatory Framework

ILEC Network Element or Service	Regulatory Framework	Degree of Regulation
Access to poles, ducts, conduits, rights of way	Detailed cost-based pricing formula	High
Voice grade copper loops	ILECs must provide access at TELRIC prices whenever "reasonably efficient" competitor is "impaired"	High
DS1 and DS3 fiber loops	ILECs must provide access in wirecenters with low line density and few collocated CLECs	Medium
High-speed data transmission, including Ethernet, ATM, Frame Relay and OCn	Dominant ILECs regulated but increasing forbearance; non-dominant ILECs must provide access at non-discriminatory rates and conditions, but lack of enforceable regulations	Low
Broadband Internet access (cable, DSL, wireless, BPL) and dark fiber	Treated as information services not subject to common carrier regulation but subject to antitrust oversight	Unregulated

low which such obligations apply.[30] In addition to these rules that survived from the 1996 rewrite of the Telecommunications Act, some older regulations apply. Most importantly, with very few exceptions (such as lack of capacity), ILECs and other utilities have to grant third party access to poles, ducts, and conduits at regulated prices. ILECs also have a continuing obligation to make their services available for resale at a regulated discount (retail minus avoided cost). All other formerly unbundled services continue to be available at a negotiated rate. During the transition period, price increases for such network elements remained below the threshold permitted by the FCC.[31]

Although the set of interacting variables is complex and one has to exert caution when linking two variables in a causal way the empirical record suggests that the elimination of unbundling rules has shifted investment decisions as predicted. After the elimination of UNE-P, this form of service-based access declined rapidly. By 2006, only 28 percent of access lines were based on the platform, only half the number of two years prior. Local loop unbundling has slightly increased from 12 to 15 percent. However, CLEC-owned and operated lines had expanded from 22 to 36 percent of all competitive access lines. US experience does not necessarily imply that unbundling is a poor policy option but it points to the importance of applying the correct price setting method and the necessity to understand the relevant trade-offs between its short-term and long-term effects in determining unbundling obligations. The TELRIC standard aims at mimicking the competitive long run equilibrium price of an efficient supplier.[32] However, these models do not take into account that real world telecommunications markets are characterized by sunk costs and uncertainty. More recent contributions to the research literature take dynamic effects of unbundling rules into account.[33] Several authors have pointed out that the option value of unbundled access is not reflected in TELRIC prices.[34] Therefore, the formula distorts investment decisions by both incumbents and new entrants. Pindyck suggests the addition of a premium on the implicit rate of return used to calculate unbundled prices. In his analysis, the appropriate premium varies between 1 and 5 percentage points depending on the variability of the market and of demand side factors.[35]

These implications from the theory of real options are not undisputed. For example, Noam cautions that

[30] In the market for special access, the FCC defined Tier 1 markets as those metropolitan areas with a presence of four or more fiber-based collocators and more than 60,000 business lines. Tier 2 markets are characterized by the presence of four or more fiber-based collocators and more than 38,000 business lines. Tier 3 markets have fewer than four fiber-based collocators and fewer than 38,000 business lines. The regulatory treatment of service providers is then tied to these classifications. For example, DS1 loops need to be made available to competing carriers unless a building is located in a Tier 1 market.

[31] Cf. B. J. Gregg: A survey of unbundled network elements, Public Service Commission of West Virginia, 2006.

[32] Cf. D. E. M. Sappington: On the design of input prices: can TELRIC prices ever be optimal, in: Information Economics and Policy, Vol. 18, No. 2, 2006, pp. 197-215.

[33] Cf. M. E. Cave, I. Vogelsang: How access pricing and entry interact, in: Telecommunications Policy, Vol. 27, No. 10-11, 2003, pp. 717-727; T. M. Valletti: The theory of access pricing and its linkage with investment incentives, in: Telecommunications Policy, Vol. 27, No. 10-11, 2003, pp. 659-675; D. M. Mandy, W. W. Sharkey: Dynamic pricing and investment from static proxy models, Washington DC, 2004, Federal Communications Commission, Office of Strategic Planning and Policy Analysis; and M. Bourreau, P. Doğan: Unbundling the local loop, in: European Economic Review, Vol. 49, No. 1, 2005, pp. 173-99.

[34] Cf. J. Hausman: The effect of sunk cost in telecommunications regulation, in: J. Alleman, E. M. Noam (eds.): Real options in telecommunications, Dedham, MA 1999, Artech House, pp. 191-204; and R. S. Pindyck: Mandatory unbundling and irreversible investment in telecom networks, NBER Working Paper 10287, Cambridge, MA 2004, National Bureau of Economic Research.

[35] Cf. R. S. Pindyck: Pricing capital under mandatory unbundling and facilities sharing, NBER Working Paper 11225, Cambridge, MA 2005, National Bureau of Economic Research.

in industries with first-mover advantages the insights from real options theory may need to be modified.[36] His concerns point to the importance of taking the competitive situation into consideration. If intra-modal competition is the only relevant option, more stringent unbundling may have stronger and more desirable effects than if there is strong inter-modal competition. Lastly, the effect of unbundling will depend on the overall conditions of the industry. If the environment is risky, easier unbundled access will, all other things being equal, render service-based entry a more attractive option than facilities-based competition. In any case, the important lesson is that the stringency of unbundling has important effects on the dynamic incentives of incumbents and new entrants that need to be taken into account explicitly.

Policies toward Next-Generation Networks

US law and regulation rarely use the term of "next-generation networks" (NGN). The Telecommunications Act of 1996 speaks of "advanced networks and services" and establishes the absence of regulation as the default framework. Nonetheless, decisions in three areas have affected the development of the infrastructures and services commonly discussed under the NGN heading: broadband unbundling, decisions clarifying the legal status of broadband services as either common carrier telecommunication services or nearly unregulated information services, and decisions freeing service providers from non-discrimination rules established in the 1970s and 1980s.

As broadband access was not yet a mass market phenomenon, the unbundling rules promulgated by the FCC in 1996 were designed to facilitate competition in the fixed voice market. This changed somewhat in 1999, when the Commission introduced line sharing as a separate unbundled network element. In many states, the prices for unbundled high-frequency loops were relatively low, as most state Public Utility Commissions considered the cost of the local loop to be recovered in the prices of voice services.[37] However, the D. C. Court of Appeals vacated the line sharing rules in 2002 with the argument that the FCC had not considered the market leadership of cable nor the potential disincentives for the investment and innovation decisions of ILECs and CLECs.[38] In response, in 2003 the FCC's Triennial Review Order (TRO) established a three-year time table to phase-out line sharing.[39] According to the provisions in this Order, between 2003 and 2006, ILECs had to allow line sharing, but were allowed to charge higher prices than in the past. Prices could increase to 25% of the full copper loop price in year 1, 50% in year 2, and 75% in year 3. Under the transition plan, new customers could only be added during year 1. Furthermore, ILECs will have to allow line splitting, a scenario in which a CLEC acquires a local loop but only uses the high-frequency circuit and leases the voice channel to another CLEC.

The Triennial Review Order also had eliminated unbundling requirements for fiber deployment to the premises (FTTP) in new developments ("greenfield" projects) to stimulate investment in these next generation platforms. Responding to a request for reconsideration by Bell South and other ILECs, in October 2004 the Commission clarified that this exemption would also apply to fiber-to-the-curb (FTTC) projects, in which fiber extends to within 500 feet of all the customers served by that loop.[40] If an ILEC were to overbuild copper loops, it would either have to keep the copper loop in service or make a narrowband channel available on an unbundled basis if the copper loop is retired. More specifically, ILECs must provide access to a voice grade channel via time division multiplexing (TDM) technology or, if no TDM is available, make a 64kbps channel available. In the Triennial Review Order, the FCC had also eliminated the broadband sharing requirement for hybrid loops. In hybrid networks fiber is deployed to points that do not qualify as FTTP or FTTC. In such cases, CLECs may deploy their own networks to the fiber termination point of the ILEC ("remote terminal") and then lease the remaining copper loop (called "subloop"). No other unbundling rules, such as bitstream access, exist for broadband access markets. Although not primarily designed with NGN markets in mind, the wholesale and special access provisions as well as the third party access rules to poles and ducts discussed in the previous section also have implications for the evolution of NGN services.

[36] Cf. E. M. Noam: Interconnecting the network of networks, Cambridge, MA 2001, MIT Press.

[37] Cf. J. E. Nuechterlein, P. J. Weiser: Digital crossroads: American telecommunications policy in the Internet age, Cambridge, MA 2007, MIT Press.

[38] Cf. D. C. Circuit Court: United States Telecom Association v. FCC, 290 F.3d 415 (D.C. Cir. 2002), Washington, DC, 2002, (USTA I).

[39] Cf. Federal Communications Commission: In the Matter of Review of the Section 251 Unbundling Obligations of Incumbent Local Exchange Carriers; Implementation of the Local Competition Provisions of the Telecommunications Act of 1996; Deployment of Wireline Services Offering Advanced Telecommunications Capability, CC Dockets Nos. 01-338, 96-98, 98-14, Report and Order and Order on Remand and Further Notice of Proposed Rulemaking, Federal Communications Commission, February 20, 2003, Washington, DC (Triennial Review Order).

[40] Cf. Federal Communications Commission: In the Matter of Review of the Section 251 Unbundling Obligations of Incumbent Local Exchange Carriers, Order on Reconsideration, CC Docket No. 01-338, October 18, 2004, Washington, DC.

The second set of policies with relevance for NGN has to do with the classification of broadband access services. US telecommunications law distinguishes between telecommunications services (essentially defined as transportation services that do not modify the information stream) and information services. Whereas the former are treated as common carrier services and thus subject to a broad range of regulatory safeguards – including non-discrimination requirements, the requirement that prices be just and reasonable, and the requirement to seek prior approval for price changes – the latter are essentially unregulated. Broadband services were initially deployed to the mass market by cable companies, who are not treated as common carriers. This created asymmetric market conditions, as telephone companies were treated as common carriers when offering DSL services. After several local cable franchise authorities had attempted to write common carrier-like provisions into cable franchises, the FCC in 2002 declared cable modem service as an information service. The ensuing legal conflict was decided by the US Supreme Court in 2005 in the Brand X case, which affirmed the authority of the FCC to make such declaratory findings.[41] In the wake of this decision, the agency quickly moved to also declare other broadband access platforms as information services, including DSL (2005), wireless broadband access (2007) and broadband via power line (2007). Thus, by the end of 2007, all relevant broadband access platforms had been relieved from common carrier regulation. As information services, they are only subject to the generic authority of the FCC to regulate communication services in the public interest should it deem necessary. Presently, no specific regulations are based on this authority, leaving broadband access essentially unregulated.

The third set of policies that affects NGN dates back to Computer Inquiry II conducted in the late 1970s and concluded in 1981. In these inquiries, the FCC had promulgated rules guiding the participation of telecommunications service providers in data communication markets. One set of legacy rules that are still applicable obligates dominant ILECs to make high speed data transmission, such as Ethernet, Frame Relay, ATM, and optical networking, which are primarily bought by large enterprise customers, available at regulated conditions to other operators. Dominant suppliers had to file tariffs, typically with two weeks lead time, provide cost information to support any price changes, and charge just, reasonable and non-discriminatory prices. Non-dominant ILECs in theory also had to make such services available at just, reasonable and non-discriminatory conditions. Because the FCC had eliminated the requirement to file tariffs, it is difficult to enforce these provisions. During the past two years, the FCC has significantly relaxed the enforcement of these rules. In response to petitions from major ILECs, including AT&T, Verizon, and Embarq, the FCC granted these companies forbearance (that is, the rules, while not eliminated from the books, will not be applied) from the more detailed forms of economic regulation. In AT&T's case, forbearance will take full effects only in 2009, as the company is subject to certain safeguards imposed in the course of the merger with Bell South. Overall, the provisions dating back to Computer Inquiry II also have been relaxed considerably.

While the reasons for deregulation are necessarily tied to the specifics of the case, the rationales provided by the FCC also have certain recurring elements. One main reason is seen in the changed technological landscape, in particular the growing importance of packet networks, wireless communications, and satellites. These platforms have enabled many new services and continue to promise a continuous stream of innovations. Hence, in assessing competition the technological trajectories need to be taken into account, even if specific products are not yet commercially available on the market. In many cases, it is inter-modal competition that matters more than intra-modal competition. Market boundaries therefore need to be drawn sufficiently broad. Existing regulations are often seen as legacy rules not well suited to the new technological environment and hence with potentially high costs. In this context the effects of regulations on investment and innovation decisions are deemed as critical. Regulation may be afflicted with high indirect costs if such incentives are reduced or biased. Overall, the lines of reasoning are strongly influenced by notions of dynamic competition.

Despite these measures in favor of unregulated competition, the FCC has also expressed its vision that open access to the public Internet is an important public value. In August 2005, in parallel with the declaration that DSL will be treated as an information service, the agency issued a policy statement in which four essential freedoms were affirmed. The FCC emphasized that consumers have a right to access any content of their choice, to access applications and

[41] Cf. US Supreme Court: National Cable & Telecommunications Association v. Brand X Internet Services, 125 S. Ct. 2688, 2005, Washington, DC. The US Supreme Court did not review whether the FCC's declaration was warranted in substance.

services of their choice, to attach terminal equipment of their choice (with safeguards), and to a competitive market environment. Whereas the statement is not very detailed and not legally binding, one must conclude that the agency intends to deal with possible abuses on a case-by-case basis, with a general promulgation of rules only considered if persistent abuse becomes visible. At the legislative level, several attempts to establish principles of network neutrality failed during 2006 and 2007. Currently, one bill, the Internet Freedom Preservation Act of 2007, sponsored by Senators Dorgan and Snowe, is pending in Congress. This bill would establish certain minimal principles of network neutrality while not fully prohibiting the differentiation of platforms.

A Flexible Approach to Regulatory Uncertainty

The key features of the US approach can be further clarified from a decision making under uncertainty perspective. In dynamic market environments, the present regulatory framework is not only contingent upon past and present but also the expected future state of competition. In the US, regulatory choices with regard to broadband unbundling suggest an explicit forward-looking view and a strong trust that the emerging market structure will be characterised by robust workable competition. The US model does not adopt a leap-of-faith attitude, assuming that future markets will per se be workably competitive. Rather it can be seen as a response to the risk of regulatory error.

A framework to take the repercussions of uncertainty on regulatory choices more systematically into account illustrates these differences. Two principal options exist: if the future state of competition is exogenous to regulatory decisions, the decision could be modeled as a "game against nature," using traditional tools of decision-making under uncertainty, such as the minimax method. The assumption that the future state of competition is independent of preceding regulatory decisions is too limiting, however. Future market conditions are influenced by the present and expected future regulatory framework as these rules shape the incentives of incumbent service providers and potential new entrants. Therefore, in contrast to the established view of regulation, which models regulation contingent upon existing market conditions and rarely takes the effect of regulation on competition into account, future market structures are often endogenous to regulation as well. If this endogeneity is relevant, the game against nature approach cannot be utilised. It is, however, possible to use an alternative method based on an examination of the possible errors of present regulatory decisions.

Table 2
Possible Costs of Forward-looking Regulation

$Regulation_t$	$True\ market\ structure_{t+1}$	
	Workable competition	Non-workable competition
No ex ante regulation, full reliance on antitrust oversight	Correct	Type II error
Ex ante regulation (e.g., control of wholesale and/or retail prices)	Type I error	Correct

This framework has been used in antitrust and regulatory cases.[42] Weisman has applied it to develop criteria for regulatory forbearance in voice markets.[43] Bauer pointed out that the framework is more appealing for new and emerging rather than existing markets.[44] In the simplest case, two future competitive states (workable competition, non-workable competition) and two regulatory approaches (no regulation, regulation) can be distinguished. In a more differentiated approach, more future competitive states and regulatory approaches are used. The main principles of the framework can be illustrated using the simplified two-by-two scenario (see Table 2).

A correct decision in period t requires that the regulatory model adopted matches the true competitive situation in period t+1. This is quite different from much of current regulation, which often tacitly adopts a "rear-view mirror" perspective in that it is strongly based on the existing market structure. If ex ante regulation was retained in period t in anticipation of a non-competitive market structure in period t+1, but the underlying structure is a workably competitive market, a Type I error (false positive) was committed. If ex ante regulation was eliminated in period t in anticipation of a workably competitive market structure in period t+1 but the emerging true market structure does not sup-

[42] Cf. F. S. McChesney: Talking 'bout my antitrust generation: competition for and in the field of competition law, in: Emory Law Journal, Vol. 52, No. 3, 2003, pp. 1401-1438.

[43] Cf. D. L. Weisman: Principles of economic regulation and forbearance. Testimony submitted on behalf of TELUS Communications, Inc. in the Matter of Forbearance from Regulation of Local Exchange Services, Canadian Radio-Television and Telecommunications Commission (CRTC), PN-2005-2, June 21, 2005, Ottawa.

[44] Cf. J. M. Bauer: Economic foundations of forbearance in local exchange service Markets, Testimony submitted on behalf of the Consumer Groups in the Matter of Forbearance from Regulation of Local Exchange Services, Canadian Radio-Television and Telecommunications Commission (CRTC), PN-2005-2, June 22, 2005, Ottawa.

port workable competition, a Type II error (false negative) was committed. Ideally, the choice of a regulatory approach will minimise the cost of errors. In the context of antitrust policy, McChesney has argued that Type II errors (the failure to punish firms violating fair competition principles) are systematically less costly than Type I errors.[45] As long as competitors may enter the market, a self-correcting mechanism exists. In the second case, i.e. in a situation where behavior that is compatible with fair competition is punished, there is no such corrective process. In antitrust law, which deals with cases in industries that are presumed to allow workable competition, this analysis is compelling.

Weisman, in his analysis of forbearance for local exchange services, extends the argument to industries that were historically subject to regulation.[46] However, the antitrust analogy does not automatically apply to markets that may be characterised by significant market power. Consequently, a general claim that Type II errors are less harmful cannot be sustained without some qualifications. If the true market structure is indeed workably competitive, continued regulation (a Type I error) may delay its emergence. One reason is that regulation constrains supernormal profits, which is one of the forces attracting new competition in a dynamic market. Another reason is that the weaknesses in the regulation of inputs, discussed above, may retard facilities-based entry. Consequently, a workably competitive market structure will only emerge slowly. On the other hand, the remedy for Type II errors is not competition but antitrust and regulatory measures. Whereas these measures are not costless, they may provide effective solutions. Therefore, if a market does not develop a workably competitive structure corrective action will be possible. Moreover, an initial approach without regulation will trigger a different learning and experimentation process than one that prolongs regulation. Given the conditions of dynamic telecommunications technology, these arguments suggest that in new markets the potential costs of Type I errors outweigh the potential costs of Type II errors.

Although it was not explicitly invoked in policy debates, the US approach toward NGN follows the logic of this method. When the new regime was put into place, the anticipated future market structure was one of workable competition. The FCC's policy statement of August 2005 indicated that the agency would be willing to promulgate new measures to safeguard openness of Internet access if evidence of abuse would accumulate. Other models are being discussed that attempt to achieve similar goals, most prominently the notion of a "regulatory holiday". Several differences exist between the US model and this proposal. First, the US model is based on the expectation that workable competition will prevail and hence no schedule to re-introduce regulation at a future point in time exists. This overcomes the potential time-inconsistency problem inherent in the regulatory holiday model. Second, as it has not been tried out before, no empirical evidence is available that a regulatory holiday will accelerate facilities investment. On the other hand, there is considerable evidence, in telecommunications and in other industries, that markets stimulate investment. Third, the notion of a regulatory holiday has been compared to patent law. This analogy is incomplete at best. Whereas patent law grants a limited exclusive period during which an inventor may exploit a patent, it also obliges the holder to completely disclose the invention to stimulate subsequent innovation. The regulatory holiday model does not define such an obligation whereas the FCC's intention to promulgate openness rules in case of abuse amounts to a similar provision.

Under conditions of uncertainty, regulatory decisions will be dependent on the degree of risk aversion, the trust in the effectiveness of antitrust and regulatory institutions to deal with Type II errors, assessments as to the potential costs of Type I errors, and other regulatory and policy attitudes. The framework also allows an argument in favor of allowing more regulatory differentiation, be it at the state or national level. Under conditions of uncertainty some degree of institutional diversity can be a more rational policy overall. It may facilitate institutional learning that is a better understanding of the effects of different institutional arrangements on sector performance.

Conclusions

Since the 1970s, researchers and policy-makers have developed an increasing interest in learning from the practices and experience in other nations and regions. Emulation of regulatory and policy innovations has become one of the sources of improved governance of information and communication industries. This paper describes and critically comments on the transformation of the theoretical underpinnings of practical regulation in the US. Our analysis suggests that the US regulatory framework has evolved in three phases: until the 1970s, practical regulation was pre-

[45] Cf. F. S. McChesney, op. cit.

[46] Cf. D. L. Weisman, op. cit.

dominantly shaped by the static perspective; it was more strongly influenced by the comparative static approach until the late 1990s; and it is presently in another transition to a dynamic regulation approach, relegating the other perspectives to a less prominent role. The current phase recognizes increasingly investment and innovation as a core challenge of the design of a regulatory framework. It acknowledges the inherent uncertainty of the new environment and views investment and particularly innovation as a disequilibrium problem. In contrast to full reliance on antitrust and competition law, dynamic regulation attempts to deliberately shape rules of market interaction in ways that are perceived as most conducive to the overarching objectives for the communication industries.

The emerging approach is particularly visible in the area of unbundling and next-generation network policy. Earlier unbundling obligations of ILECs in the voice markets and the few in the broadband markets were largely eliminated. Different broadband access platforms were declared as information services to create a symmetric legal and regulatory framework for the various providers. Legacy rules governing high-speed data communications were neutralized using the mechanism of forbearance. The new approach trusts that competition among the two dominant suppliers, the cable and telephone companies, is intensified by the competitive fringe of smaller service providers, in particular the existing and expected entry of wireless service providers in broadband markets. Overall, competition is seen as sufficiently robust and workable to warrant elimination of unbundling obligations and to allow industry consolidation. Moreover, the new policy rests on a strong belief that deregulation will facilitate facilities-based competition and thus a more robust competitive situation in the medium and long term.

The empirical evidence of the evolution of voice and broadband access markets in the US is consistent with the dynamic theory of investment and the anticipated effects of the regulatory changes. Due to the short observation period and the multiple additional factors involved, caution is required when interpreting these positive and possible negative outcomes as causal effects of the new regulatory framework. In narrowband markets, where the FCC eliminated switching as an unbundled network element (and thus UNE-P), competitors have reacted with accelerated deployment of their own loops and a stronger interest in simple resale. In broadband access markets, the growth rate of DSL has increased and consistently been above that of cable. Moreover, deployment of fiber and wireless broadband is growing at a high rate (with the caveat that FCC data revisions limit the comparability of fiber data). A trade off may exist between short term costs and the longer term benefits associated with facilities based competition. For example, beginning in the second half of 2005 the total number of access lines provided by CLECs declined and the elimination of unbundling rules probably has complicated market conditions for competitors building their business model on wholesale access. However, as evidence from mobile and broadband markets indicates, facilities-based competition has considerable longer term benefits.

We suggest that a key feature of the US approach can be understood from a perspective of decision making under uncertainty. Under conditions of uncertainty it can be a more rational policy to allow some degree of institutional diversity and a trial-and error approach. Such an approach seeks to avoid Type I errors, at the price of increasing the risk for Type II errors (ex ante regulation under conditions of workable competition vs. no ex-ante regulation under conditions of dominance). Such diversity is a precondition for institutional learning in the form of a better understanding of the effects of different institutional arrangements on sector performance. In the US, regulatory choices with regard to unbundling and next-generation networks suggest a strong trust that the emerging market structure will be characterised by robust workable competition.

Given the different institutional frameworks, the US does not necessarily offer a policy blueprint that could be directly adopted by other countries without further examination. However, the new US approach with its strong reliance on dynamic competitive thinking offers an interesting conceptual framework to shape forward-looking regulatory decisions affecting NGN networks and services. Other nations should review the approach and monitor its effects. US policy is again diverging from the approaches in other nations. It is taking a new step in favor of dynamic market-based competition. In mobile markets this approach is paying off after the US initially lost ground compared to peer nations. The slipping of the US in international broadband rankings during the past years may have a similar cause: that facilities-based competition takes a longer time to unfold than service-based competition. It remains to be seen whether the US approach will yield sustainable facilities-based competition in the medium and long run. So far, the empirical data seems to indicate that it is moving in that direction.