

Changing Roles of the State in Telecommunications*

Johannes M. Bauer**

ABSTRACT

Since the nineteenth century, the state has played different roles in telecommunications, from owner-operator and regulator to facilitator of private sector activities. Whereas direct government involvement has diminished since the 1980s, recent years have witnessed renewed demands for intervention and a stronger role of the state. This *article* reviews the different roles of the state, weighs their advantages and disadvantages, and assesses the state's future involvement. It concludes that a return to broad state ownership in telecommunications is unlikely. However, the balance between private and state activity has been and will continue to be pragmatically realigned, resulting in new institutional arrangements that might better take advantage of the comparative strengths of the public and the private sector.

Key words: State ownership, Privatization, Liberalization, Regulatory reform,
Industrial policy

JEL classification: L32, L33, L50, L96, L98

※ 논문접수일: 2010. 2. 26, 수정일: 2010. 3. 16, 게재확정일: 2010. 3. 19

* An earlier, condensed version of this paper is forthcoming in R. Negrine and S. Papathanassopoulos (eds.), *Communications policy: Theory and Issues*, Basingstoke, UK: Palgrave Macmillan.

** Department of Telecommunication, Information Studies, and Media, Quello Center for Telecommunication Management and Law, Michigan State University, East Lansing, Michigan 48824, USA

E-mail: bauerj@msu.edu, Internet <http://www.msu.edu/~bauerj>

I . INTRODUCTION

Since the nineteenth century, the state has performed several roles in telecommunications, ranging from owner-operator of infrastructure and services, regulator, to facilitator of private sector initiatives. The public sector increased its role for a variety of reasons, in different ways, and in a multiplicity of forms. In some nations military control of communication facilities dominated. In others the postal service monopoly was extended to electronic communications, which was initially seen as a complement to mail. Starved for tax revenues, other nations saw telecommunications as a promising revenue-generating activity. The state also intervened to overcome the unsatisfactory performance of private telephone service providers. These multiple inroads are documented in a plethora of internationally comparative studies (see Duch, 1991; Dyson & Humphreys, 1986; Millward, 2005; Noam, 1992) and in national case studies (Eliassen & From, 2007; Hulsink, 1999; Karlsson, 1998; Thatcher, 1999). In North America the state became involved as a reluctant regulator to prevent the abuse of market power by private firms (Phillips, Jr., 1993; Temin & Galambos, 1987). During the early twentieth century the view that telecommunications was a “natural” monopoly – implying that it would be most economical to entrust the provision of services to exclusive franchisees – was gradually accepted.

Institutional responses to this policy challenge varied in Europe and North America, the two regions to which this paper is largely confined. In the US and Canada, a system of privately owned utilities, subject during the late nineteenth century to oversight by municipalities and beginning in the twentieth to regulation by specialized state and federal agencies, was the dominant choice. In contrast, in Europe, with few exceptions such as Spain and Italy, state ownership was the dominant model. Government oversight was executed through parliament and ministerial departments but no specialized regulatory agencies were established. Throughout most of the twentieth century, state ownership and government regulation were considered alternative, mutually exclusive, forms of public control

of sectors deemed of critical importance to economy and society. This situation started to change beginning in the 1970s as weaknesses of the state-owned postal, telephone, and telegraph companies (PTTs) to provide efficient information and communication infrastructure became visible. At the same time, trust in the ability of government agencies to successfully regulate monopolies started to fade and made room for a stronger belief in deregulation and the superiority of market organization and competition.

External regulation by specialized agencies was considered a more efficient institutional arrangement than state monopoly (or at least a second-best necessity during the transition from monopoly to competition). Therefore, as PTTs were gradually privatized, countries that historically had opted for state ownership established independent regulatory agencies to oversee the reorganized incumbent service providers. The owner-operator state was gradually transforming into the regulatory state (Jessop, 2002; Majone, 1996). Institutional reform and sector reorganization often did not unfold in synchronized and swift action, however. In many countries, the reduction of state ownership proceeded at a slower pace than market liberalization. Such asynchronicity gave rise to the new and somewhat paradoxical institutional form of partially state-owned enterprises regulated by state agencies, creating potentially serious principal agent and incentive problems. The competitive reorganization of the sector also revealed renewed shortcomings in the ability and expediency of private sector investment to expand advanced communication infrastructures to more rural communities. Consequently, forms collective ownership, which had been found obsolete and wanting since the 1980s, started to make a rebound. Many communities became newly involved in projects to close a perceived investment gap. In the wake of the financial crisis of 2008, governments worldwide are launching stimulus packages, many of which include considerable investment support for broadband networks and services.

This article reviews these metamorphoses of the state from heavy involvement in the provision and regulation of telecommunication services to its more indirect role as a regulator to the more recent return of the state with a focus on Europe and

North America. While there may be an appearance of cyclicity, a return of the “old” state, such parallels are only superficial. The role of the state has adapted in response to a multitude of forces, including new challenges faced by the sector, the evolving economic and technical conditions, changing political conditions, and shifts in the configurations of relevant stakeholders attempting to shape communications policy. Due to the historical differences in sector organization, the specific forms of transformation differed in North America and in Europe. The debate on state ownership was cast in terms of privatization, liberalization and regulation in Europe while it revolved around deregulation, liberalization and more recently the renewed involvement of public sector bodies – mostly states, cities, and municipalities – in North America. Europe established regulatory agencies as part of the sector restructuring package. Consequently, during the 1980s and 1990s, the institutional arrangements governing US and European telecommunications started to resemble each other. However, the approaches of the two regions started to drift apart once more with the more aggressive deregulatory course adopted by the US Federal Communications Commission (FCC) at the beginning of the twenty-first century. With regard to the third aspect of state intervention, industrial, fiscal, and monetary policy, the role of the state has remained strong in Europe and has only lately been reinstated in North America.

The following three sections of this paper review the roles of the state as owner-operator, regulator, and facilitator. Section five revisits the conceptual arguments for and against state involvement in the light of the most recent developments. The article concludes with an outlook on the future roles of the state and government intervention in telecommunications.

II . THE STATE AS OWNER AND OPERATOR

Throughout most of the twentieth century, despite the existence of many national differences in the details of sector organization, telecommunications in the

predecessor nations of the EU-27 was dominated by state-owned monopolies. The only exceptions were Italy and Spain, where mixed public-private and fully private firms offered services (Foreman-Peck & Müller, 1988; Noam, 1992). National fragmentation was seen as a major obstacle to the integration of the European market. In response, beginning in the 1980s, the European Commission, Council, and Parliament — supported by decisions of the European Court of Justice — began to harmonize national policies, to liberalize national and trans-European markets, and to introduce transparent regulation. Shaped by nearly 30 directives from the European Commission and the Council since 1988, terminal equipment, value-added services, mobile services, cable services, and satellite services were liberalized. In 1998, the last remaining monopoly domain, entry into basic services and network infrastructure, was eliminated (Cave & Valletti, 2000; Hulsink, 1999; Jordana, 2002).¹⁾ Whereas the initiatives of the 1990s were focused on facilitating a transformation from monopoly to a competitive sector organization, two subsequent Communications Reviews, one in 1999 (effective in 2003) and one in 2007 (final implementation pending at the time of writing), aimed at adapting the regulatory framework to emerging market environment (in particular the accelerated convergence between traditional telecommunications and electronic media) and to ascertain continued benefits to consumers (de Streel, 2008). Implementation of the 2007 reform measures was in progress at the time of writing and is expected to be completed by 2010. The 1999 Reform introduced an approach built explicitly around the forward-looking application of competition law principles. Ex ante regulatory intervention was limited to instances of single or joint market dominance (Buigues & Rey, 2004; Cave & Prosperetti, 2001; de Streel, 2003).

While liberalization measures were binding to the member states, the EU did not stipulate any particular ownership regime but left the choice to national governments (Clifton et al, 2003). Most likely, this is the outcome of the pragmatic attempt to avoid a heated debate among member states on state ownership issues

1) In recognition of the more significant economic challenges faced by Greece, Ireland, Portugal, and Spain liberalization deadlines were generally staggered.

that might have delayed the whole liberalization process. Moreover, it was also compatible with a broad research literature that had pointed out that, while ownership rights mattered, competition was probably more important than ownership for sector efficiency (Bortolotti et al, 2002; Megginson & Netter, 2001; Newbery, 1999; Vickers & Yarrow, 1988). Given this overall approach, member states had to obey the competition rules of the EU Treaty and establish non-discriminatory and transparent regulation regardless of ownership status.

<Table 1> Public ownership in main telecom operators in EU-15 (1990 and 2008)

Country	Incumbent	State ownership (in percent)	
		1990	2008
Austria	Telekom Austria	100.0%	28.7%
Belgium	Belgacom Group	100.0%	53.5%
Denmark	TDK	100.0%	0.0%
Finland	TeliaSonera ¹	100.0%	59.0%
France	France Telecom	100.0%	27.3%
Germany	Deutsche Telekom ²	100.0%	31.7%
Greece	OTE	100.0%	28.0%
Ireland	Eircom	100.0%	0.0%
Italy	Telecom Italia	40.0%	0.0%
Luxembourg	P&T Luxembourg	100.0%	100.0%
Netherlands	KPN	100.0%	7.8%
Portugal	PT Comunicações, S.A.	100.0%	8.4%
Spain	Telefónica	32.0%	0.0%
Sweden	TeliaSonera ¹	100.0%	59.0%
UK	BT	50.1%	0.0%

Notes: ¹ TeliaSonera is 17.3 percent owned by the Finnish government and 45.3 percent by the Swedish government; ² 14.8 percent owned directly by the federal government, 16.9 percent KfW bank (owned by the federal and state governments).

Sources: Own research, OECD (2009, pp. 43-44).

Despite this acceptance of public ownership nearly all member states of the EU-15 began selling state-owned telecommunications service providers during the 1990s. The UK had already started to privatize British Telecom (now BT) in the

early 1980s. In 1990, 12 of the incumbent PTOs in the EU-15 countries were still fully state-owned; one was majority state-owned; and in two cases the state held a minority share (see Table 1). National struggles between proponents and opponents of privatization resulted in different patterns and outcomes (Levi-Faur, 2003; Schneider, 2001). 14 of the 15 nations sold shares of the incumbent Public Telecommunications Operators (PTOs) to private investors. To avoid stressing the stock market and bolster sales revenues, privatization typically occurred in multiple tranches over several years. By 2008, five of the EU-15 countries had divested all ownership. The Netherlands and Portugal had retained a non-controlling stake of less than 25%. Three countries held a minority ownership of more than 25% but less than 50%. Three countries still owned a majority of the stock; only P&T Luxembourg remained in full state ownership. In TeliaSonera, which had been formed by the merger of the former Finnish and Swedish incumbents, the two states jointly held majority ownership.

At the same time as the state reduced its ownership stake in the wireline industry, PTOs expanded their presence into wireless services. However, the presence of the state turned out to be less pervasive than in wireless communications. Licenses for first generation, analog mobile voice service had been issued during the era of monopoly in the 1970s and 1980s and hence went to the incumbent PTOs (Curwen, 2002; Gruber, 2005; Gruber & Valletti, 2003). During the early 1990s the first digital mobile voice licenses were awarded. In contrast to analog mobile voice, more than one license was made available allowing the entry of new competitors. The rapid growth of digital mobile services resulted in additional license awards during the late 1990s, typically to new entrants. In an increasing number of cases these were based on auctions an assignment method in which incumbents could not benefit from good relations to government. Consequently, mobile markets historically were less concentrated and the share of customers served by fully and partially state-owned service providers was also much lower than in fixed services. Some PTOs provide mobile services themselves but many have established a separate subsidiary, which is often only partly owned by the PTO. As the PTO

share in the mobile market in most countries is much lower than in fixed services, state influence in the mobile market overall is only a fraction of that in the fixed services industry.

In the US and Canada, telecommunications was historically dominated by investor-owned, regulated service providers. State ownership played a larger role in Canada, where three provinces (Alberta, Manitoba, and Saskatchewan) were historically involved in the provision of telecommunication services (Jorgenson, 1990). After World War II Canada's commitment to the Commonwealth resulted in the nationalization of overseas communications in a Crown corporation, the Canadian Overseas Telecommunications Corporation (COTC, which later became Teleglobe). During the late 1980s and early 1990s, most of these companies were sold to private investors, typically in qualified auctions or limited negotiations. For example, in 1987 Teleglobe Canada was sold to Memotec Data, Terra Nova Telecom was sold to BCE in 1988 and Telesat Canada to Alouette Telecommunications in 1992. In 1990, the government of Alberta established Telus Communications as a parent company to facilitate the privatization Alberta's telephone crown corporation (AGT). Shares in Telus were sold to the public in 1990 and 1991. Telus later also purchased another public telephone company, Edmonton Telephones (EdTel) and developed into one of the leading Canadian private carriers.

In comparison, state ownership played less of a role in the US. Proposals to nationalize the telephone system during World War I failed to gather sufficient support in Congress putting the country on a course of state regulation of investor-owned firms.²⁾ Municipal enterprises and cooperatives played a supplementary role, mostly in rural areas. They were generally exempt from regulation by state and federal regulatory agencies. US government was prominently involved in designing, rolling out and operating the US Department of Defense's APRANET. This core

2) On July 24, 1918, President Woodrow Wilson issues a proclamation placing the US telegraph and telephone systems under the direction of the Post Office Department. This was effective 31 July 1918 through August 1, 1919.

network was later expanded to the civilian sector by NSFNET, operated by non-profit organizations, later in collaboration with IBM and MCI, until its full privatization in the mid-1990s (Hafner & Lyon, 1996).

More recently, however, state and municipal governments have become involved in building backbone networks and municipal wireless networks, or at least in facilitating and coordinating their deployment, often in response to slow roll out of infrastructure by the private sector. The performance record of these initiatives is mixed. A large number of first-generation projects experienced financial difficulties, caught in a trap of higher-than-anticipated costs and lower-than-anticipated demand. A second-generation of initiatives is based on broader assessments of the total benefits to a community, for example, for the provision of emergency or public safety services. In municipal wireless services, three models seem to be emerging: (1) full subsidy by the public agency to a private operators; (2) anchor tenancy by the agency to provide ascertain the operator of a base level of demand; and (3) public ownership and operation (Huang, 2008). Furthermore, many of the more than 2,000 US municipal electric utilities have entered the provision of broadband services, taking advantage of existing rights of ways and networks needed to operate their power systems. Private industry looked at these municipal initiatives as unfair competition and lobbied state legislatures and Congress to prevent such public endeavors, reaching legislative limitations or outright prohibitions in several states, including Colorado, Florida, and Nebraska (APPA, 2004). Empirical evidence does not seem to support the claim of unfair competition or crowding out. Rather, municipal utilities seem to complement privately owned service providers (Gillett et al, 2004; Hauge et al, 2008).

Overall, whereas the state has withdrawn significantly from the ownership and operation of telecommunication services important countertrends exist. These often are initiated in areas in which market forces, competition, and regulation, the three main pillars of the reforms of the 1980s and 1990s, produced outcomes that were deemed unacceptable by the affected communities. The present renaissance of the state can therefore be seen, to a considerable degree, as the response to the

disappointment of overly optimistic expectations as to the range of services that decentralized market forces spawn and of the timeline with which they would deliver them. It is also compatible with research on the role of ownership and privatization, pointing out that private ownership creates clearer incentive structures but that it is not a sufficient condition to achieve lasting efficiency gains. We will come back to this theme in section four, after a discussion of the role of the state as a regulator.

III. THE STATE AS A REGULATOR

Historically, regulation by specialized agencies was established as an institutional alternative to state ownership. However, both public ownership and regulation require and are enabled by legislative action by the state. Until the 1980s, regulation of telecommunications by specialized government agencies was a unique US and Canadian institutional arrangement. This does not mean that regulatory functions were absent outside of these nations but they were typically embedded in the operations of the state-owned service provider, resulting in a peculiar blending of operational and quasi-regulatory tasks in one entity. For example, PTOs typically would certify terminal equipment for use on their networks or they would handle customer complaints. The confounding of these roles was probably one of the reasons why initial policy responses to the changing economic and technological landscape of communications were undertaken much later in countries that had historically relied on state-owned monopolies than in the US, where emerging stakeholders and interest groups had more options to challenge the regulatory status quo ante. Public ownership and external commission regulation are two alternative instruments intended to achieve similar purposes, most importantly the correction of forms of market failure and market deficiency as well as and the achievement of public values that are beyond the working of unfettered market forces (Gómez-Ibáñez, 2004; Newbery, 1999; Phillips, Jr., 1993).

Within the regulatory profession, a distinction is often made between economic and social regulation. Analytically, this is fuzzy at best, as any economic regulation has social implications and any social regulation economic consequences. Social regulation is similarly concerned with fairness and equity rather than efficiency. As efficiency is only defined in a meaningful way with respect to a specific bundle of rights and obligations, one could argue that social concerns of regulation precede economic concerns and that efficient economic regulation can only be established once the social objectives are stated. In publicly owned firms, these goals were pursued simultaneously but often in ways that raised many principal-agent conflicts between different government units making demands. For example, PTTs were regularly asked by national legislative and executive bodies to pursue universal service goals, to maintain affordable process, to stabilize employment in times of economic downturns (Nowotny, 1982), and to cross-subsidize loss-making operations such as the postal service. These multiple goals were difficult to reconcile and often left management without clear directions. The model reached its limits when massive investments in network upgrades were required in the 1970s and 1980s, at a time when public budgets were strained making additional budget allocations difficult.

The “internal regulation” model of public ownership allowed taking public policy considerations other than efficiency into account. There are instances, in which this arrangement worked, in particular if transparent principal agency relations were established. The Swedish operator Telia could perhaps be cited as an example (see Karlsson, 1998). Overall, however, there are more cases in which the public ownership model suffered from unclear principal agency structures and often conflicting demands (Aharoni, 1986). In contrast, external regulation requires an open and more transparent discussion of these aspects and therefore a somewhat better opportunity to implement economic and social regulatory goals in an overall compatible fashion. Nonetheless, there are also cases when regulatory agencies failed to employ such coherent solutions, for example, when universal service mandates are imposed without explicit compensation.

Three periods may be distinguished in the historical evolution of government regulation of telecommunications: (1) monopoly regulation; (2) transition from monopoly to a more open market structure; and (3) regulatory intervention in unevenly competitive markets. The relevance of these phases, the timeline of the transition from the first to the third phase, and the specific tasks assigned to regulation vary depending on the country and the region. In US telecommunications, monopoly regulation was gradually phased out between the late 1950s and the 1980s by releasing market segments deemed structurally competitive from regulatory oversight (Brock, 1981; Faulhaber, 1987; Horwitz, 1989). During the period from the break-up of the Bell System in 1984 until the passage and practical implementation of the Telecommunications Act of 1996, which declared competition as the basic organizational principle of US telecommunications, regulation went through a final pro-competitive transition (Brock, 1994, 2003). The period 2003-2005 is a reasonable marker for the beginning of the latest phase. By then, the successor companies of the Bell System all had met the conditions established in the Telecommunications Act as preconditions to enter in-region long-distance markets. At the same time, the stringent unbundling rules that had been imposed on incumbent local exchange carriers (ILECs) in voice markets were significantly curtailed and aligned with the rules applied in other countries. Furthermore, broadband access markets were successively declared as essentially unregulated information service markets (Bauer, 2005b; Nuechterlein & Weiser, 2007).

During the late 1980s, Europe, stirred by a sense that its telecommunications industry was falling behind the US and a few emerging nations in Asia, embarked on an ambitious program of market structure and regulatory reform. Led by the European Commission, within a relatively brief period of little more than a decade monopolies were abandoned and replaced by a more openly competitive market structure (Michalis, 2006; Steinfield et al, 1994). Like in the US, terminal equipment, value-added services, and mobile communications, were successively opened to new entrants. By 1998, all market segments were fully liberalized, with

regulation gradually shifting from retail to wholesale markets. In two Communications Reviews, the European Union has continued this process of reducing regulatory intervention and expanding competition. Regulatory tasks in the EU are pursued by National Regulatory Authorities (NRAs). NRAs coordinate with each other, most importantly within the European Regulators Groups (ERG), and with the European Commission.

Ex ante regulatory intervention is based on a systematic and periodic assessment by national regulatory authorities and the European Commission of the presence of significant market power. The relevant market segments are delineated and evaluated in a joint procedure. The toolkit of NRAs is limited by a list of remedies deemed appropriate in relevant European legislation. During the latest review of the regulatory framework, the Commission had proposed establishment of a European Regulatory Agency but the idea failed in the European Parliament. Instead, the European Regulators Group (ERG) will play a more systematic role in coordinating national approaches. Given this two-tier system, national regulation is homogenized by joint European efforts but retains a certain degree of national diversity. Whereas the European Commission continues to be concerned about the fragmentation of the European telecommunications industry, such national diversity is not necessarily bad. It may provide an environment that facilitates institutional learning, as countries will be able to learn from each others' experience, a learning process that would not be possible in a fully homogenous approach.

The gradual privatization process in Europe created a peculiar new and untested arrangement: state-regulated, fully or partially state-owned ("mixed") enterprises (Bauer, 2005a). Government regulation was initially designed as a means to exert public control over investor-owned firms. This separation created a clear (but not necessarily unproblematic or efficient) principal-agent relation. In the case of regulated mixed firms, the state is both regulator and part-owner, a dual principal and agent. The overall effect of this multiplicity of roles is difficult to predict. On the one hand, there is a risk that it may be abused to adopt regulatory provisions favorable to the former state-owned service provider (even if they are within the

boundaries of acceptable discretionary choices by the regulatory agency). On the other hand, there may also be institutional advantages to the arrangement. Analyzing privatization, Perotti (1995) argued that partial state ownership can stabilize investor expectations and serve as a credible signal that the state will not adopt vindictive policies after privatization.

A similar argument could be made with respect to regulated mixed firms: state regulatory agencies, attempting to signal independence from government, might be inclined to bias their policies against the former state-owned enterprise. Mixed ownership might shield the partially privatized firms from vindictive, unreasonable regulation. Bauer (2005a) and Edwards and Waverman (2006) argue and provide empirical evidence that the degree of regulatory independence is an important mediating factor. The risk of capture by the state is lower if the regulatory agency is truly independent from the executive branch of government. Another possible advantage of mixed firms is that they could provide a more effective tool to realize public values that are difficult to implement with regulatory tools. The public owner, it is argued, for example by Eckel and Vining (1985) could commit management to pursue goals such as universal service on its own motivation whereas private shareholders would ascertain that demands are not unreasonable and compatible with the financial sustainability of the organization. In other words, mixed ownership would provide a more efficient principal-agent structure than full state ownership. Bauer(2005b) did, however, not find strong evidence that mixed regulated firms provided such quasi-public goods to a higher extent than either public or private regulated firms.

The establishment of regulation also changes the political dynamics of telecommunications policy. Although created as an institutional arrangement to assist in determining and implementing public values by balancing conflicting interests (such as consumer interests in low prices with investor interests in achieving a sufficient return on the invested capital), it has been criticized for failing to achieve that goal. The deregulatory movement in the US was strongly influenced by political economic theories that diagnosed serious flaws in the

working of regulatory agencies. The Chicago School (e.g., Becker, 1983; Peltzman, 1976; Stigler, 1971) asserted that, due to asymmetric information and transaction costs, regulators openly or inadvertently are captured by well-organized interests, typically the regulated industry. In a different vein, the Virginia School (Buchanan, Tollison, & Tullock, 1980) claimed that the existence of regulatory agencies (or government in general) would inevitably lead to rent-seeking activities by stakeholders trying to pursue their own advantage. In the process, potential welfare gains would be reduced or fully dissipated. A sprawling political and economic literature on regulation has explored other aspects of the political dynamics of regulation (Bailey & Pack, 1995; Joskow & Noll, 1981; Majone, 1996; Noll, 1989).

Overall, while many models explain specific facts, none seems well-aligned with the broader picture of empirical observations. These suggest that regulation may fall anywhere on the spectrum from regulation in the public interest (as earlier theories had uncritically assumed) to regulation that benefits special interest groups at the expense of others. Where on this spectrum practical regulation is positioned is not least dependent on the institutional setup of a country and the organization of the regulatory agencies (e.g., their independence from other branches of government) (Levy & Spiller, 1996). The complexity of the problem to be solved and hence the degree of dependence of the agency on information from the regulated industries will also play a role. Furthermore, the age of the regulatory system may have an influence with more mature systems more plagued by inertia and stakeholder lobbying than new ones) (Goldberg, 1976). In recent US regulation the locus of influence shifted clearly from potential new market entrants during the 1990s to incumbents (late 1990s until 2009), and content providers (2009 and forward). In Europe, the introduction of national systems of regulation coordinated and shaped by action at the European level has contributed to a significant expansion of lobbying activities. The increasing number of stakeholders, like in the US, has most likely rendered it more difficult to find feasible and sustainable policies.

Between the late 1980s, when regulatory reform in European telecommunications started, and the early 2000s, the policy model in the US and in Europe increasingly looked alike. However, this period of regulatory convergence has been succeeded by renewed regulatory divergence, in particular in the area of next-generation networks (broadband and ultra-broadband). In its latest Communications Review in 2007, the EU essentially retained the basic framework introduced a few years earlier based on a three part test. Ex ante regulation is only warranted if (1) a market is dominated by one firm or jointly by several, (2) competition is not emerging, and (3) competition policy cannot take care of the issue (Marcus, 2003). However, the US Federal Communications Commission, in part in response to court decisions that settled challenges to earlier regulatory policies, since 2003 has adopted a much stronger deregulatory model. Beginning in 2003, the stringent local loop unbundling policy that had been introduced in the wake of the Telecommunications Act of 1996 and which indirectly also had intensified competition in broadband, was curtailed to a more modest approach more in line with international practice. More importantly, after the 2005 *Brand X* decision by the US Supreme Court affirmed the FCC's jurisdiction to classify services, the agency between 2005 and 2007 declared ADSL, wireless broadband, and broadband over power lines (BPL) as essentially unregulated information services (Bauer & Bohlin, 2008).

These declaratory rulings eliminated the common carrier obligations of the service providers in these markets, freeing them from the requirement to make their services available at just and reasonable prices and non-discriminatory terms and conditions. Abandonment of these rules has triggered a debate on the obligations that network operators should have in their dealings with content and application providers. These latter market players often need access to the upstream services provided by network platforms. Upstream providers that do not offer the services or applications in question will most likely realize the complementarity and cooperate with firms in these market segments. Nonetheless, they may try to appropriate part of the rents available in these markets and hence have a dampening effect on

innovation. If the network operator is also active in the services and application markets, it may have a stronger incentive to sabotage a competing provider of services that does not operate its own network. The ongoing network neutrality debate obfuscates some of these nuances. Nonetheless, the anticipated policy decisions might shape the communications ecosystem decisively (see the discussion in Bauer, 2010). As European nations did not eliminate openness provisions at the network layer, they do not have such an intense network neutrality debate, at least not at the moment.

Not only has the scope of regulation been reduced considerably, in the process the tools of regulation were refined and modified substantially. Early monopoly focused predominantly on prices; other aspects of the regulated firm's operation were subject to regulatory control because they affected the level and structure of prices. Regulation was typically based on the costs of service provision, requiring detailed systems of accounting rules, scrutiny of cost data, and a time consuming regulatory cases. In the US and Canada, this process became increasingly cumbersome with the reduction of regulation, which required increasingly complicated separation of joint and common costs for regulated and unregulated operations. European nations, looking for more streamlined forms of regulation, instead used somewhat simpler forms of price cap regulation (although the periodic recalibration typically relied on cost reviews). Price cap regulation was introduced somewhat later in the US but is not widely used for the few retail services that remain regulated (Ai & Sappington, 2002; Sappington & Weisman, 1996). In both regions, the focus of economic regulation shifted from retail prices to the regulation of wholesale prices (e.g., for unbundled access, network interconnection) (A. Phillips, 2002; Vogelsang, 2003). Market-based instruments are increasingly used in spectrum management since the introduction of spectrum auctions in the US in the early 1990s (Gruber, 2005). The introduction of competition across all telecommunication services necessitated reliance on market-compatible instruments for the pursuit of social regulatory goals. Where universal service and universal access are considered important public policy goals, universal service funds, based

on explicit contributions by market players and transparent disbursement mechanisms, are increasingly used.

Although government regulation is the predominant form of national public control and coordination in telecommunications, a multiplicity of alternative governance arrangements has emerged in the industry. Self-regulation, voluntary agreements between affected stakeholders, and co-regulation by government and non-government players, are increasingly used to address coordination issues affecting the Internet and new media (Latzer et al, 2003; 2006). For example, codes of governance are widely used to address policy issues in new media. The global integration of communications has led to an increasing number of international agreements. With the framework of inter-governmental organizations, the International Telecommunication Union (ITU), the World Trade Organization (WTO), and the World Intellectual Property Organization (WIPO) have negotiated and adopted treaties that have become embedded in national legislation and regulation. These range from agreements on trade in services to agreements harmonizing telecom regulation (WTO) to treaties governing intellectual property in a digital age (WIPO).

In addition to these realms of global governance, new forms of global multi-stakeholder coordination have emerged in response to the many governance issues raised by the Internet. In contrast to inter-governmental approaches, these are often bottom-up processes in which many non-government stakeholders interact. Primary examples are the Internet Corporation for Assigned Names and Numbers (ICANN), the Internet Governance Forum (IGF), and the two World Summits on the Information Society (WSIS) conferences in Geneva and Tunis, from which these new arrangements emerged (Antonova, 2008; Bygrave & Bing, 2009; Hofmann, 2005; Malcolm, 2008; Mathiason, 2008; Mueller, 2002). Both inter-governmental forms of coordination and multi-stakeholder forms of governance raise complicated issues. In the first case, the separation between the subject and the object of governance is blurred; in the second case, questions of legitimacy (many of the non-government groups have no formal delegated authority) and

implementation arise (likewise, many of the non-government groups lack the authority to enforce rules) but are beyond the scope of this contribution (see Mayntz, 2008 for an insightful discussion).

IV. THE STATE AS A FACILITATOR AND STOPGAP

The European telecommunications liberalization debate has shifted the focus from the state as an owner to its role as a regulator, as is succinctly reflected in the emergence of the notion of a “regulatory state” (Majone, 1996), a term also used to refer to the corresponding shift in US policy during the early twentieth century (Glaeser & Shleifer, 2003). Nonetheless, governments on both sides of the Atlantic continued to intervene with other means in the information and communication technology sectors. The economic crisis of 2008 has seen a renewal of some of these efforts, which may be labeled as forms of “industrial policy” as well as interventions in which the state acts as a “stopgap” to overcome the weaknesses and deficiencies of an unregulated market economy (Thiemeyer, 1983). The forms and instruments of industrial policy vary widely between the EU and the US. Policy-makers in European nations and at the European Commission in Brussels have historically placed stronger trust in the ability of the state to enhance the competitiveness of firms and sectors and to facilitate their adaptation to changing economic conditions. In the US, on the other hand, industrial policy was pursued more indirectly, mostly through programs related to the military. The Internet can be traced back to ARPANET, funded for many years by the US Department of Defense but many other defense-related programs have also supported research and development in ICT. As mentioned in section two above, lower-level government agencies (states, municipalities), that had historically played a role in building energy and communications infrastructures, are renewing efforts to support investment in advanced telecommunication infrastructure.

European integration has somewhat constrained and narrowed the toolkit available to the member states, as such measures need to be compatible with the overarching principles of the European Treaties. Financial aid, subsidies, tax incentives, consolidation measures, or the granting of regulatory exemptions must not contradict the competitive principles and the basic economic freedoms upon which the EU is built. Within these broad constraints, the EU has crafted many programs to assist the European information and communication technology industry, ranging from efforts to set Europe-wide standards to the facilitation of research and development (R&D) and the reliance on the public sector to generate demand pull for innovation. As a comprehensive overview of these multiple initiatives would far exceed the scope of this paper, a few pointers must suffice (see EC, 2008; Ungerer, 1988 for an early report). Recent efforts received a major push in the Lisbon Agenda (sometimes also referred to as “Lisbon Strategy”), which had been adopted by the European Council in Lisbon in 2000. This initiative envisioned making Europe into the “most dynamic and competitive knowledge-based economy in the world ... by 2010”. Two sub-programs within the Lisbon Agenda, eEurope 2002 and eEurope 2005, focused on advancing access to and use of the Internet and the advancement of broadband access, network security, and e-government. Based on recommendations in a mid-term review of these plans (High Level Group, 2004), in 2005 the European Union launched the i2010 initiative as a new overarching framework (EC, 2005). It comprises efforts in information and communication technology and media, coordinating regulatory policy (discussed in the previous section), research and development efforts, and other forms of public-private partnerships within an overarching set of concerns. The programs within the i2010 program fall into four broad categories: (1) measures to support the integration into a Single European Information Space; (2) programs supporting innovation and investment in ICT research; (3) initiatives to promote inclusion, better quality of life, and public service; and (4) focus programs under the heading of flagship initiatives (e.g., European Digital Libraries, ICT for sustainable development).

Individual EU member states pursue many complementary programs to these EU-level initiatives. With the increased recent concern about broadband deployment and adoption, many national governments, including France, Greece, Ireland, and Italy, have launched or are discussing programs to support the roll-out of broadband to rural and remote areas.³⁾ Likewise, several cities and municipalities, for example Amsterdam, are building broadband networks and others are considering building wireless networks, often as public private partnerships. For example, Berlin, Germany recently announced the deployment of a WiFi network to cover major parts of the city.⁴⁾ These projects are well intended but their impact on the overall investment volume and infrastructure deployment has not been fully examined. Contradictory effects are at work. On the one hand, such projects may incent private providers to accelerate their investment plans so as to not face second-mover disadvantages. Such bandwagon behavior of major private service was, for example, found in a comparative study of four rural US communities (LaRose et al, 2008). On the other hand, such public investment projects weaken the business case for private investors, especially if broadband access is granted free of charge.

In the US, federal policy for the past few years was dominated by a strong belief in the superiority of market forces. However, even the staunchest advocates for private, market-driven investment recognize that, due to financing constraints and potentially lower private returns on investment, the network infrastructure will only gradually be extended to less densely populated areas. Concerned about being left behind and excluded from the benefits of the information society, many states and municipalities have launched initiatives to accelerate the deployment of advanced communications networks and services. According to information collected by The

3) See the European Broadband Portal, <http://www.broadband-europe.eu/Pages/Home.aspx>, for information on projects and strategies across the EU.

4) See "Berlin Residents to Get Free Wireless Internet", *Spiegel Online*, 26 February 2009, <http://www.spiegel.de/international/germany/0,1518,610028,00.html> (last visited 26 March 2010).

Alliance for Public Technology (APT) in collaboration with the Communications Workers of America (CWA), by 2008, 32 states operated their own backbone networks and many made capacity on these networks available to third parties; 26 US states had established a total of 29 authorities to support broadband deployment; 24 programs affecting 27 states existed to provide direct financing of broadband projects; nine public private partnership had been founded; seven states supported investment indirectly via tax credits (APT & CWA, 2008). In addition, several hundred municipalities have taken a lead in the roll-out of wireless broadband networks, as described in section 2 above.

The federal government took a more active role in the American Recovery and Reinvestment Act (ARRA) of 2008, which earmarked a total of \$7.2 billion in the form of loan guarantees, subsidies and ancillary measures to broadband. The funds will be administered by the Rural Utility Service (RUS), an agency within the US Department of Agriculture, which had been instrumental in bringing electricity and telephone service to rural America during the twentieth century, and the National Telecommunications Information Administration (NTIA), an agency within the US Department of Commerce. As projects funded by these initiatives will have to voluntarily commit to open network policies, they will probably also constrain the ability of existing, recently deregulated broadband access providers to price differentiate their platform services. Given concerns about network neutrality, such institutional diversity may thus have unanticipated positive effects on the entire ICT system. The most recent initiative toward more state intervention in the US is the National Broadband Plan, delivered by the FCC to Congress in March 2010 (FCC, 2010). Although implementation details are still to be developed, its more than 200 recommendations are a concerted effort to generate the highest possible synergies between the public and the private sector. Key areas of the plan are measures to support robust competition, to ease access to assets controlled by the government such as public infrastructure and spectrum, reform of the universal service funding system to include broadband, and measures to facilitate advanced applications in health care, education, and e-government.

V. THE ROLE OF THE STATE RECONSIDERED

The crisis of the financial services industry in 2008 and the following economic downturn have, within a very short period of time, contributed to a redefinition of the role of the state in telecommunications. Recent orthodoxy, that the state ought to focus on designing and implementing an appropriate regulatory framework but neither own nor operate telecommunications networks and services, was superseded by a new pragmatism that attributes a larger and more diverse roles to the state. This rethinking does not go so far as to abandon the overall emphasis on the state as a regulator. However, other roles of the state are experiencing a renaissance and are once again accepted as legitimate means of public policy. This is not an overnight development, as criticism on the deregulatory policies, such as the slow expansion of broadband to rural areas if driven by market forces alone, had been latent and increasingly supported by empirical evidence. Pronouncements of the return of a new Keynesianism (Katz, 2009) may be premature.

Nonetheless, the balance between private market forces and government has been realigned in favor of an increased role of the state. There is renewed acknowledgement that under certain conditions the state may be the appropriate organization to pursue public values in infrastructure sectors. This is a learning opportunity for public policy and, if utilized, one may hope that a new generation of policies will be shaped that takes the relative advantages and disadvantages of different institutional arrangements into account. The theory and practice of governance have evolved remarkably since the first onset of the privatization and deregulation movement. Moreover, practical experience with alternative policies and the empirical study of these diverse governance arrangements has also deepened our understanding of their possibilities and shortcomings.

Empirical research has generated a vast array of insights and this paper can only provide a few hints to a few patterns that seem to emerge from that literature. In addition to case studies, an increasing number of contributions use econometric

approaches, including cross-sectional approaches and, in some ways more powerful, cross-sectional time-series models. The use of statistical methods has benefited this research agenda but it has also obfuscated the view as to the relevant theoretical modeling. For example, many papers model institutional arrangements as 0-1 dummy variables, as if they either exist or do not exist. In practice, institutions are more multi-faceted phenomena. For example, a PTO is not just public or private, but may come in many ownership arrangements in between. Likewise, regulation is not just independent or not. Authors regularly also do not question whether the methodological assumptions upon which econometrics is based – that each independent variable is a necessary and sufficient condition for a dependent variable – is justifiable when studying institutional arrangements. Institutions often work as “configurations” rather than as separable, additive factors, which is difficult to capture with econometric models, even if interaction terms are specified. With these caveats in mind, empirical research has nonetheless broadened the knowledge base upon which present and future policy decisions can be made.

One of the recurring insights from these studies is that the economic, political, and legal context, in which reforms take place, matters and that it interacts with ownership and regulatory variables. In general, studies agree that liberalization and competition constitute a stronger efficiency-enhancing factor than privatization on performance measures such as retail price, service diffusion, and service quality (Bortolotti et al., 2002; Megginson & Netter, 2001; Ros, 1999; Wallsten, 2001). The degree of independence of the regulatory agency also is an important contributor to such efficiency gains. Moreover, the timing and sequencing of reforms matter: if privatization takes place before liberalization and other regulatory reforms are adopted, its effects are often weakened due to inherent trade-offs between the goal of achieving a high sales price and the intensity of competition in the post-privatization market. Where privatization precedes liberalization, as was the case in the UK, it may entail opportunity costs to society. For example, efficiency gains may be delayed if the incumbent is temporarily protected from competitors in an effort to increase its sales value (Wallsten, 2004). Based on a

broad conceptual comparative analysis of different institutional arrangements, Jones (2009) concludes that external regulation is better suited than state ownership or laissez-faire to secure widely shared public values such as reliability and affordability of service.

Research is much more ambiguous and split with regard to the policy choices that are most conducive to support investment and innovation in telecommunications. Several authors have found that regulatory instruments intended to ease entry by new competitors, such as unbundling and open access, have improved static performance measures such as the number of market entrants and prices (e.g., Boylaud & Nicoletti, 2001). The relationship between regulation and dynamic efficiency is more complicated and probably non-linear. Neither monopoly nor perfect competition but market structures in between are most conducive to dynamic efficiency. Unbundling and other forms of open access policies that increase the intensity of competition therefore will increase the incentives to invest and to innovate as long as competitive intensity is below a critical threshold, but they will decrease these incentives if competitive intensity is increased above it. The exact location of this critical threshold is not known and more research will be necessary. Such non-linear relationships between competition and innovation have been found for a broad range of industries (Aghion et al, 2005). It is therefore possible that measures aimed at maximizing competitive intensity (and thus static efficiency) inadvertently reduce dynamic efficiency. Several studies have found evidence of this effect (Crandall et al, 2004; Friederiszick & Röller, 2006; Waverman et al, 2007). Similar trade-offs, although with additional complications, hold with respect to the emerging battlefield of largely vertical network relations, mostly between content and application providers and network operators, as discussed in the network neutrality debate (Bauer, 2007; Bauer & DeMaagd, 2008).

These findings suggest that some degree of concentration in telecommunications may work in support of dynamic efficiency. However, given the potentially high economies of scale in the provision of network platforms, concerns about suboptimally high industry concentration are frequently articulated (Trebing, 2004).

Of particular concern is the combination of industry concentration and vertical integration in next-generation networks, in which greater diversity is possible in the provision of applications and services. Such arrangements may create incentives for the vertically integrated provider to sabotage a competitor in the services market that needs access to a network. The evidence for such scenarios is limited but is nonetheless of concern. Unfortunately, drafting a set of regulatory rules that would alleviate all concerns is difficult if not impossible to specify. Moreover, it may have new disadvantages for the innovative dynamics of the ICT value net. Some authors have therefore suggested that the most important role of the state is in the safeguarding of broad interoperability rules (Werbach, 2009).

The available empirical observations are also compatible with conceptual research on governance. As discussed in this paper, the traditional dichotomy between markets and hierarchies, which underpinned much of the regulatory reform debate, has been broadened and enriched with other, hybrid forms of governance arrangements. Self-regulation, the voluntary adoption of rules by stakeholders, has potential advantages in situations in which a significant part of the relevant knowledge is proprietary and if the problem is subject to rapid change. One particular weakness of self-regulation is the potential lack of enforceability of the voluntary rules. Co-regulation, an arrangement in which the state delegates the implementation of collectively binding rules to the private and non-profit sectors, tries to overcome this potential flaw by combining the authority of the state with the advantages of self-regulation. A full assessment of co-regulation in telecommunications is outstanding. Governance in these new arrangements often unfolds in network structures that combine aspects of hierarchies and decentralization.

Compared to the early days of heavy government involvement, either as an owner or a regulator, telecommunications governance has become a more multiplex, multi-layered, and light-handed arrangement. This is particularly evident if the increasing importance of international and global interdependencies and the expanding role of international governance arrangements are taken into account. The state is only one actor among others. It continues to enjoy a privileged position,

even if it is weaker than the traditional view of the omnipotent, omniscient, and benevolent force. However, it is certainly not as weak as portrayed in a newly fashionable view that sees the state as a powerless actor on a global stage. In pursuing its role, the state continues to use the whole arsenal of policy instruments in its disposal, including direct ownership and operation of telecommunications infrastructure and services, regulation, and other means of public policy, including fiscal, monetary and industrial policy measures. The debate of the past two decades has sharpened our understanding of the advantages and disadvantages of alternative arrangements. Carefully designed policy could utilize these insights and delineate a new hybrid role of the state, in which the newly dominant role as regulator is complemented in certain areas with the old role as an operator and service provider, as well as an orchestrator of self- and co-regulation.

VI. RECAP AND OUTLOOK

This chapter has reviewed three roles of the state: as owner and operator of telecommunications infrastructure and services, as regulator of private and more recently also mixed public-private firms, and as the proponent of various forms of auxiliary policies intended to nudge the industry onto a more efficient path. In all three areas fundamental transformations have occurred. The 1980s and 1990s were characterized by a shift from the state as owner and industrial policy-maker to the state as a regulator. The past few years have seen a renewed recognition that there are realms in which these traditional roles have a legitimate place. As a result, some rebalancing in the mix of these functions has occurred. Despite the partial return of the state the wheel of history has not returned to its starting point at the turn from the nineteenth to the twentieth century, when the classical roles of the state first took shape in Europe and North America. Rather, a combination of theoretical insights, practical experience, and political changes have interacted to generate a more pragmatic view of the relative roles of the state, markets, and innovative other institutional arrangements, including networks and the gift-like economies of

groups like the open source or spectrum commons communities. As technology and markets diversify it can be expected that the diversity of institutional arrangements likewise increases with renewed roles for the state as well.

REFERENCES

- Aghion, P., Bloom, N., Blundell, R., Griffith, R., & Howitt, P. (2005). Competition and innovation: An inverted-U relationship. *Quarterly Journal of Economics*, 120(2), 701-728.
- Aharoni, Y. (1986). *The evolution and management of state-owned enterprise*. Cambridge, MA: Ballinger.
- Ai, C., & Sappington, D. E. M. (2002). The impact of state incentive regulation on the U.S. telecommunications industry. *Journal of Regulatory Economics*, 22(2), 133-159.
- Antonova, S. (2008). *Powerscape of internet governance - how was global multistakeholderism invented in ICANN?* Saarbrücken, Germany: VDM Verlag.
- APPA. (2004). *Community broadband: Separating fact from fiction*. Washington, D.C.: American Public Power Association.
- APT, & CWA. (2008). *State broadband initiatives: A summary of state programs designed to stimulate broadband deployment and adoption*. Washington, DC: The Alliance for Public Technology, Communications Workers of America.
- Bailey, E. E., & Pack, J. R. (Eds.). (1995). *The political economy of privatization and deregulation*. Aldershot, UK: Edward Elgar.
- Bauer, J. M. (2005a). Regulation and state ownership: Conflicts and complementarities in EU telecommunications. *Annals of Public and Cooperative Economics*, 76(2), 151-177.
- _____ (2005b). Unbundling policy in the United States. *Communications & Strategies*(57).
- _____ (2007). Dynamic effects of network neutrality. *International Journal of Communication*, 1(2007), 531-547.
- _____ (2010). Regulation, public policy, and investment in communications infrastructure. *Telecommunications Policy*, 34(1-2), 65-79.

- Bauer, J. M., & Bohlin, E. (2008). From static to dynamic regulation: Recent developments in U.S. telecommunications policy. *Intereconomics: Review of European Economic Policy*, 43(1), 38-50.
- Bauer, J. M., & DeMaagd, K. (2008). *Network management practices and sector performance: a genetic programming approach*. Paper presented at the 36th Research Conference on Communications, Information, and Internet Policy, Arlington, VA.
- Becker, G. S. (1983). A theory of competition among pressure groups for political influence. *Quarterly Journal of Economics*, 98(3), 371-400.
- Bortolotti, B., D'Souza, J., Fantini, M., & Megginson, W.L. (2002). Privatization and the sources of performance improvement in the global telecommunications industry. *Telecommunications Policy*, 26(5-6), 243-268.
- Boylaud, O., & Nicoletti, G. (2001). Regulation, market structure and performance in telecommunications. *OECD Economic Studies*, (32), 99-142.
- Brock, G. W. (1981). *The telecommunications industry: The dynamics of market structure*. Cambridge, MA: Harvard University Press.
- _____ (1994). *Telecommunications policy for the information age: From monopoly to competition*. Cambridge, MA: Harvard Business School Press.
- _____ (2003). *The second information revolution*. Cambridge, MA: Harvard University Press.
- Buchanan, J. M., Tollison, R. D., & Tullock, G. (Eds.). (1980). *Toward a theory of the rent-seeking society*. College Station, TX: Texas A&M University.
- Buigues, P. A., & Rey, P. (Eds.). (2004). *The economics of antitrust and regulation in telecommunications: Perspectives for the new European regulatory framework*. Cheltenham, UK and Northampton, MA: Edward Elgar.
- Bygrave, L. A., & Bing, J. (Eds.). (2009). *Internet governance: Infrastructure and institutions*. New York: Oxford University Press.
- Cave, M., & Prosperetti, L. (2001). The future of European communications regulation: An assessment of the European Commission's 1999 Communications Review. In C. Robinson (Ed.), *Regulating utilities: New issues, new solutions* (pp. 99-116). Cheltenham, UK and Northampton, MA: Edward Elgar.

- Cave, M., & Valletti, T. (2000). Regulation and competition in telecommunications. In G. Galli & J. Pelkmans (Eds.), *Regulatory reform and competitiveness in Europe, 2: Vertical issues* (pp. 330-361). Cheltenham, UK and Northampton, MA: Edward Elgar.
- Clifton, J., Comín, F., & Díaz Fuentes, D. (2003). *Privatisation in the European Union: Public enterprises and integration*. Dordrecht, Boston: Kluwer Academic Publishers.
- Crandall, R. W., Ingraham, A. T., & Singer, H. J. (2004). Do unbundling policies discourage CLEC facilities-based investment? *Topics in Economic Analysis and Policy, 4(1)*, 1-23.
- Curwen, P. (2002). *The future of mobile communications: Awaiting the third generation*. New York: Palgrave.
- de Streel, A. (2003). Market definitions in the new European regulatory framework for electronic communications. *Info, 5(3)*, 27-47.
- _____ (2008). Current and future European regulation of electronic communications: A critical assessment. *Telecommunications Policy, 32(11)*, 722-734.
- Duch, R. M. (1991). *Privatizing the economy: Telecommunications policy in comparative perspective*. Ann Arbor, MI: University of Michigan Press.
- Dyson, K., & Humphreys, P. (1986). *The politics of the communications revolution in Western Europe*. London: Cass.
- EC. (2005). i2010 – A European information society for growth and employment. Brussels: Commission of the European Communities, COM (2005) 229 final.
- _____ (2008). *Preparing Europe's digital future: i2010 mid-term review*. Brussels: European Commission, Information Society and Media. COM(2008) 199, SEC(2008) 470, Volumes 1, 2, 3.
- Eckel, C. C., & Vining, A. R. (1985). Elements of a theory of mixed enterprise. *Scottish Journal of Political Economy, 32(1)*, 82-94.
- Edwards, G., & Waverman, L. (2006). The effects of public ownership and independence on regulatory outcomes. *Journal of Regulatory Economics, 29(1)*, 23-67.

- Eliassen, K. A., & From, J. (Eds.). (2007). *The Privatisation of European Telecommunications*. Aldershot, UK; Burlington, VT: Ashgate.
- Faulhaber, G. R. (1987). *Telecommunications in turmoil: Technology and public policy*. Cambridge, MA: Ballinger Publishing Company.
- FCC. (2010). *Connecting America: The National Broadband Plan*. Washington, DC: Federal Communications Commission.
- Foreman-Peck, J., & Müller, J. (1988). *European telecommunications organisations*. Baden-Baden: Nomos Verlagsgesellschaft.
- Friederiszick, H. W., & Röller, L.-H. (2006). *Analysing the relationship between regulation and investment in the telecommunication sector: Review of the EU regulatory framework for ecommunications*. Berlin: European School for Management and Technology.
- Gillett, S. E., Lehr, W. H., & Osorio, C. (2004). Local government broadband initiatives. *Telecommunications Policy*, 28(7-8), 537-558.
- Glaeser, E. L., & Shleifer, A. (2003). The rise of the regulatory state. *Journal of Economic Literature*, 41(2), 401-425.
- Goldberg, V. P. (1976). Regulation and administered contracts. *Bell Journal of Economics*, 7(2), 426-452.
- Gómez-Ibáñez, J. A. (2004). *Regulating infrastructure: Monopoly, contracts, and discretion*. Cambridge, MA: Harvard University Press.
- Gruber, H. (2005). *The economics of mobile telecommunications*. Cambridge, UK; New York, NY: Cambridge University Press.
- Gruber, H., & Valletti, T. M. (2003). Mobile telecommunications and regulatory frameworks. In G. Madden (Ed.), *Emerging telecommunications networks. The international handbook of telecommunications economics, volume II* (pp. 151-179). Cheltenham, UK and Northampton, MA: Edward Elgar.
- Hafner, K., & Lyon, M. (1996). *Where wizards stay up late: The origins of the Internet*. New York: Simon & Schuster.
- Hauge, J. A., Jamison, M. A., & Gentry, R. J. (2008). Bureaucrats as entrepreneurs: Do municipal telecommunications providers hinder private entrepreneurs? *Information Economics and Policy*, 20(1), 89-102.

- High Level Group. (2004). *Facing the challenge: The Lisbon Strategy for growth and employment. Report by the High Level Group chaired by Wim Kok*. Brussels: Commission of the European Communities.
- Hofmann, J. (2005). Internet governance: A regulative idea in flux. In: R. K. J. Bandamutha (Ed.), *Internet governance: an introduction*, Hyderabad, India: The Icfai University.
- Horwitz, R. B. (1989). *The irony of regulatory reform: The deregulation of American telecommunications*. New York: Oxford University Press.
- Huang, K. C. (2008). *Can city-wide municipal WiFi be a feasible solution for local broadband access in the US? An empirical evaluation of a techno-economic model*. Ph.D. dissertation. University of Pittsburgh, Pittsburgh, PA.
- Hulsink, W. (1999). *Privatisation and liberalisation in European telecommunications: Comparing Britain, the Netherlands, and France*. London, New York: Routledge.
- Jessop, B. (2002). *The future of the capitalist state*. Cambridge, UK: Polity Press.
- Jones, D. N. (2009). Matching regulatory arrangements with public values in the provision of energy and telecommunications: One view. *International Journal of Public Policy*, 4(5), 435-448.
- Jordana, J. (Ed.). (2002). *Governing telecommunications and the new information society in Europe*. Cheltenham, UK: Edward Elgar.
- Jorgenson, J. J. (1990). Managing privatization and deregulation: The telecommunications sector in Canada. In D. J. Gayle & J. N. Goodrich (Eds.), *Privatization and deregulation in a global perspective* (pp. 394-412). Westport, CT: Quorum Books.
- Joskow, P., & Noll, R. (1981). Regulation in theory and practice: An overview. In G. Fromm (Ed.), *Studies in public regulation*. Cambridge, MA: MIT Press.
- Karlsson, M. (1998). *The liberalisation of telecommunications in Sweden: Technology and regime change from the 1960s to 1993*. Linköping, Sweden: LTAB.
- Katz, R. (2009). The world economic crisis: The return of keynesian economics to the new communications networks. *Telos*, 78, 13-27.
- LaRose, R., Gregg, J. L., Strover, S., Straubhaar, J. D., & Inagaki, N. (2008). *Closing the rural broadband gap. Study supported by the US department of*

- agriculture*. East Lansing, MI: Michigan State University, available at <https://www.msu.edu/~larose/ruralbb/>.
- Latzer, M., Just, N., Saurwein, F., & Slominski, P. (2003). Regulation remixed: Institutional change through self and co-regulation in the mediamatics sector. *Communications & Strategies*, 50(2), 127-157.
- _____ (2006). Institutional variety in communications regulation: Classification scheme and empirical evidence from Austria. *Telecommunications Policy*, 30(3-4), 152-170.
- Levi-Faur, D. (2003). New regimes, new capacities: The politics of telecommunications nationalisation and liberalisation. In L. Weiss (Ed.), *States in the global economy: bringing domestic institutions back in*. Cambridge, New York and Melbourne: Cambridge University Press.
- Levy, B., & Spiller, P. T. (Eds.). (1996). *Regulations, institutions, and commitments: Comparative studies of telecommunications*. Cambridge, UK and New York: Cambridge University Press.
- Majone, G. (Ed.). (1996). *Regulating Europe*. London; New York: Routledge.
- Malcolm, J. (2008). *Multi-stakeholder governance and the Internet Governance Forum*. Wembley, Western Australia: Terminus Press.
- Marcus, J. S. (2003). The potential relevance to the United States of the European Union's newly adopted regulatory framework for telecommunications. In L. F. Cranor & S. S. Wildman (Eds.), *Rethinking rights and regulations: Institutional responses to new communication technologies* (pp. 397-428). Cambridge, MA: MIT Press.
- Mathiason, J. (2008). *Internet governance: The new frontier of global institutions*. London: Routledge.
- Mayntz, R. (2008). Von der Steuerungstheorie zur Global Governance. In G. F. Schuppert & M. Zürn (Eds.), *Governance in einer sich wandelnden Welt* (pp. 43-60): Politische Vierteljahresschrift, Sonderheft 41. Wiesbaden, Germany, Verlag für Sozialwissenschaften.
- Meggison, W. L., & Netter, J. M. (2001). From state to market: A survey of empirical studies on privatization. *Journal of Economic Literature*, 39(2), 321-389.

- Michalis, M. (2006). *European governance: Communications. From unification to coordination*. Lexington Books.
- Millward, R. (2005). *Public and private enterprise in Europe: Energy, telecommunications and transport, 1830-1990*. Cambridge, UK and New York: Cambridge University Press.
- Mueller, M. (2002). *Ruling the root: Internet governance and the taming of cyberspace*. Cambridge, MA: MIT Press.
- Newbery, D. M. G. (1999). *Privatization, restructuring, and regulation of network utilities*. Cambridge, MA: MIT Press.
- Noam, E. M. (1992). *Telecommunications in Europe*. New York: Oxford University Press.
- Noll, R. G. (1989). Economic perspectives on the politics of regulation. In R. Schmalensee & R. D. Willig (Eds.), *Handbook of industrial organization, volume 2* (pp. 1253-1287). Amsterdam, Oxford and Tokyo: North-Holland.
- Nowotny, E. (1982). Nationalized industries as an instrument of stabilization policy: The case of Austria. *Annals of Public and Co-operative Economy*, 53(1), 41-57.
- Nuechterlein, J. E., & Weiser, P. J. (2007). *Digital crossroads: American telecommunications policy in the Internet age*. Cambridge, MA: MIT Press.
- OECD. (2009). *Communications outlook 2009*. Paris: Organisation for Economic Co-operation and Development.
- Peltzman, S. (1976). Toward a more general theory of regulation. *Journal of Law and Economics*, 19(2), 211-240.
- Perotti, E. C. (1995). Credible privatization. *American Economic Review* 85(4), 847-859.
- Phillips, A. (2002). What it was like, what happened, and what it's like now: Developments in telecommunications over recent decades. *Journal of Regulatory Economics*, 21(1), 57-78.
- Phillips, C. F., Jr. (1993). *The regulation of public utilities: Theory and practice*. Arlington, VA: Public Utilities Reports, Inc.
- Ros, A. J. (1999). Does ownership or competition matter? The effects of telecommunications reform on network expansion and efficiency. *Journal of Regulatory Economics*, 15(1), 65-92.

- Sappington, D. E. M., & Weisman, D. (1996). *Designing incentive regulation for the telecommunications industry*. Cambridge, MA; Washington, D.C.: MIT Press; AEI Press.
- Schneider, V. (2001). *Institutionelle Evolution als politischer Prozeß: Die Entwicklung der Telekommunikation im historischen und internationalen Vergleich*. Frankfurt am Main: Campus.
- Steinfeld, C., Bauer, J. M., & Caby, L. (Eds.). (1994). *Telecommunications in transition: Policies, services, and technologies in the European Community*. Newbury Park, CA: Sage Publications.
- Stigler, G. J. (1971). The economic theory of regulation. *Bell Journal of Economics and Management Science*, 2, 3-21.
- Temin, P., & Galambos, L. (1987). *The fall of the Bell System: A study in prices and politics*. Cambridge and New York: Cambridge University Press.
- Thatcher, M. (1999). *The politics of telecommunications*. Oxford, UK: Oxford University Press.
- Thiemeyer, T. (1983). Deregulation in the perspective of the German "Gemeinwirtschaftslehre". *Journal of Institutional and Theoretical Economics*, 139, 405-418.
- Trebing, H. M. (2004). Assessing deregulation: The clash between promise and reality. *Journal of Economic Issues*, 38(1), 1-27.
- Ungerer, H. (1988). *Telecommunications in Europe: Free choice for the user in Europe's 1992 market*. Brussels: Commission of the European Communities.
- Vickers, J., & Yarrow, G. (1988). *Privatization: An economic analysis*. Cambridge, MA: MIT Press.
- Vogelsang, I. (2003). Price regulation of access to telecommunications networks. *Journal of Economic Literature*, 41(3), 830-862.
- Wallsten, S. J. (2001). An econometric analysis of telecom competition, privatization, and regulation in Africa and Latin America. *Journal of Industrial Economics*, 49(1), 1-19.
- _____ (2004). Privatizing monopolies in developing countries: The real effects of exclusivity periods in telecommunications. *Journal of Regulatory Economics*, 26(3), 303-320.

Waverman, L., Meschi, M., Reillier, B., & Dasgupta, K. (2007). *Access regulation and infrastructure investment in the telecommunications sector: An empirical investigation*. London: Law and Economics Consulting Group with the Support of ETNO.

Werbach, K. D. (2009). Higher standards: Regulation in the network age. *Harvard Journal of Law and Technology*, 23(1), 179-225.