

Do Common Carriage, Special Infrastructure, and General Purpose Technology Rationales Justify Regulating Communications Networks?

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Abstract

We address whether regulation of communications networks remains warranted. We use the concepts of public utility, common carrier, special infrastructure, and general purpose technologies to analyze this question, as such concepts typically are invoked as foundations for continued regulation of communications networks. We examine the historical development of the public utility and common carrier concepts and find that the essential features of these constructs largely do not fit communications networks today and for the foreseeable future. More recent frameworks for economic regulation also do not fit. Communications networks are not special infrastructure because they do not exhibit zero marginal costs over an appreciable range of demand and do not exhibit a differentiating amount of social demand. Communications networks appear to satisfy the conditions for general purpose technologies, but the features of these technologies that would compel economic regulation, primarily the presence of significant externalities, are lacking.

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I. INTRODUCTION

Traditionally communications networks and services have been regulated under public utility and common carrier frameworks in the United States. Even as these frameworks are being questioned, new ideas in support of continued or expanded regulation are being put forward.¹ Recently some have proposed that communications networks should be regulated because they fall under a new notion of infrastructure, which we call special infrastructure to distinguish it from the traditional definition of infrastructure.²³ We examine each of these ideas and find that none provide adequate basis for economic regulation of current communications networks, including wireless and wireline broadband.

The initial electronic communications networks – telephone and telegraph – were placed into the common carrier and public utility designations in the early 1900s.⁴ The Federal government began its economic regulation of telecommunications in 1910 when Congress authorized the Interstate Commerce Commission – the federal agency for regulating transportation – to regulate interstate telecommunications.⁵ At this time, Federal and state laws and regulations classified telephone companies as public utilities and/or common carriers, subjecting them to corresponding economic regulations, such as provider of last resort and price averaging.⁶ The essential characteristics classifying telephone companies as such were their market power and their public franchises. Extensive subsidies became part of the regulatory system, largely through political interests in keeping local telephone prices low⁷ and through industry efforts to delay competition⁸.

Efforts to forestall competition eventually failed and the resulting predominance of competition in the sector has led to widespread deregulation of prices, entry, and exit, and to changes in the forms of the subsidies, but rarely to decreases in their overall amounts. Recently, an alternative justification has emerged for continued or expanded economic regulation of the

¹ Recent ideas for regulation include net neutrality, mobile Carterphone, and universal broadband. We do not address each specific proposal for regulation. Rather, we focus on the classification of communications services. These classifications of the foundations call for regulation or deregulation by defining the types of enterprises that can be appropriate candidates for regulation. We address these foundations.

² Sullivan, Arthur; Steven M. Sheffrin (2003). *Economics: Principles in action*. Upper Saddle River, New Jersey 07458: Pearson Prentice Hall. p. 474.

³ Sullivan defines traditional infrastructure as the basic physical and organizational structures needed for the operation of a society or enterprise, or the services and facilities necessary for an economy to function. Special infrastructure expands on this definition by adding, among the most relevant, the requirement that downstream users must exhibit significant externalities and include a wide range of private, public, and social goods. See Sullivan, *supra* note 2.

⁴ A common carrier offers services under the license of the regulator (in this case the Federal Communications Commission (FCC)), and provides its services to the public without discrimination and with the regulator's approval of the rates charged. The public utility designation applies to carriers that supply the infrastructure for a public service, and consequently are subject to regulation to protect consumers from market outcomes not in the best interests of social welfare.

⁵ Mann-Elkins Act, 61st Congress, 2nd session, ch. 309, 36 Stat. 539, enacted June 18, 1910.

⁶ The provider of last resort is the local carrier designated by the regulatory authority with an obligation to serve all customers, including the least commercially viable customers in the most remote (and therefore generally most costly) locations. The purpose of designating a provider of last resort is to ensure that service is available to all who are willing and able to pay the tariffed price. Price averaging refers to the carriers' method of pricing similarly across high and low-cost areas, and for different customers, to limit the providers' abilities to extract economic rents.

⁷ Gabel, Richard. 1967. *Development of Separations Principles in the Telephone Industry*, East Lansing, Michigan: Michigan State University Institute of Public Utilities.

⁸ Mueller, Milton. 1993. "Universal Service in Telephone History: A Reconstruction." *Telecommunications Policy* 17(5): 352- 369.

sector, namely that communications networks should be considered as special infrastructure. Special infrastructure loosely can be defined as products that have zero marginal production costs over an appreciable range of demand,⁹ and whose downstream uses exhibit significant externalities and include a wide range of private, public, and social goods¹⁰. This concept is built upon the idea of general purpose technologies (GPTs), meaning technologies that are spread pervasively to most sectors, that improve over time and thus continue to have improved benefits for users, and that make it easier to invent and produce new products or processes¹¹.

In this paper we dispel the traditional and also the more recent argument in support of categorizing communications networks as needing special economic regulation. We show that effective monopoly was an essential consideration for denoting an industry as a public utility or a common carrier, and that communications networks now generally fail to meet this requirement. We also show that communications networks fail to qualify as special infrastructure. For these reasons, we do not find justification for continued or expanded regulation of the communications sector, except in the rare instances described below.

This paper proceeds as follows. The next section analyzes the public utility and common carrier concepts. The following section describes GPTs and the fourth looks at the special infrastructure argument. The last section is the conclusion.

II. TRADITIONAL FOUNDATIONS OF SECTOR REGULATION

In this section we examine the roots and purposes of public utility and common carrier concepts to evaluate their applicability to today's markets. Traditional public utilities receive a public franchise or certificate of public convenience and necessity¹², have special obligations for serving and pricing, and are considered to be natural monopolies affected with the public interest^{13,14,15}. Common carriers, such as railroads and truckers, offer a standard service to the public; there are long-held traditions that carriers should not discriminate in pricing or in the services offered to customers^{16,17}.

⁹ A primary proponent of special infrastructure (Frischmann 2012) holds that demand must be non-rivalrous over an appreciable range. This means that marginal production costs must be zero over that range. It is inadequate for his argument that marginal production cost simply be very low.

¹⁰ Frischmann, Brett. 2012. *Infrastructure: The Social Value of Shared Resources*. New York: Oxford University Press.

¹¹ Bresnahan, Timothy F., and M. Trajtenberg. 1996. "General Purpose Technologies: 'Engines of Growth'". *Journal of Econometrics, Annals of Econometrics*, 65(1): 83–108.

¹² A certificate of public convenience and necessity is "a certificate from a public board or commission required by federal or state statute before engaging in certain public undertakings or services to protect existing franchises against injurious competition." Merriam-Webster at Merriam-Webster.com.

¹³ Glaeser, Martin G. 1927. *Outlines of Public Utility Economics*. New York, NY: The Macmillan Company.

¹⁴ Jamison, Mark A. 2011. "Liberalization and Regulation of Telecoms, Electricity, and Gas in the United States." In *International Handbook of Network Industries: The Liberalization of Infrastructure*, eds. Matthias Finger and Rolf W. Künneke, 366-383. United Kingdom: Edward Elgar.

¹⁵ Phillips, Charles F. Jr. 1993. *The Regulation of Public Utilities*. Arlington, VA: Public Utilities Reports, Inc.,

¹⁶ Cherry, Barbara A. 2003b. "Utilizing 'Essentiality of Access' Analysis to Mitigate Risky, Costly and Untimely Government Interventions in Converging Telecommunications Technologies and Markets." *CommLaw Conspectus*, 11: 251-275.

¹⁷ Cherry, Barbara A. 2007-8. "Maintaining Critical Rules to Enable Sustainable Communications Infrastructures." *Georgia State University Law Review*, 24: 947-975.

Changes in technology and market competition challenge whether communications networks continue to fit the public utility and common carrier frameworks for economic regulation. Trebing¹⁸, Miller¹⁹, and Melody²⁰ have viewed such challenges largely as an assault of neoclassical economics on the institutionalist view of government control of industry and markets.²¹ Others, such as MacAvoy, support greater deregulation and view current trends in that direction as overly cautious steps driven by the inadequacy of the utility and common carrier models to deal with partially competitive markets, which are made inevitable by technological changes²². Although writing for a different time, Goddard²³ and Gray²⁴ might see in today's struggles not just an evolution of technologies and markets, but also a conflict of visions between a paternalistic role for government and a policing role: the former would see government as properly directing industry to serve political ends,²⁵ while the latter would see government's proper regulatory role only as prohibiting exploitation in instances in which customers need the regulated service in order to function in the economy²⁶, and have no effective alternatives to the regulated enterprise's offering²⁷. Our view is that communications industries have fundamentally changed such that the traditional views no longer apply.

The following sections explore these concepts and issues in greater depth.

A) Public Utility Concept

While the economic regulation of business has a long history, the public utility concept developed over the last 150 years, largely in the United States.²⁸ Three factors led to the development of the public utility concept: (1) public dissatisfaction with the conduct of railroads in the 1800s; (2) courts identifying certain enterprises as "affected with the public interest" in the late 1800s and early 1900s; and (3) general acceptance that some industries were natural

¹⁸ Trebing, Harry M. 2001. "On the Changing Nature of the Public Utility Concept: A Retrospective and Prospective Assessment." In *Economics Broadly Considered: Essays in honor of Warren J. Samuels*, eds. Jeff E. Biddle, John B. Davis, and Steven G. Medema, 259-278. London, United Kingdom: Routledge.

¹⁹ Miller, Edythe S. 1995. "Is the Public Utility Concept Obsolete?" *Land Economics*, 71(3): 273-285.

²⁰ Melody, William H. 2002. "Designing Utility Regulation for 21st Century Markets." In *The Institutional Approach to Public Utility Regulation*, eds. E.S. Miller and W. J. Samuels, 25-81, East Lansing: Michigan State University Press.

²¹ Institutional economics focuses on understanding the role of the evolutionary process and the role of institutions in shaping economic behavior. Its main elements originated in a 1919 *American Economic Review* article by Walton H. Hamilton. Institutional economics emphasizes a broader study of institutions and views markets as a result of the complex interaction of these various institutions (e.g. individuals, firms, states, social norms). Its reintroduction in the form of institutionalist political economy is an explicit challenge to neoclassical economics, since it is based on the fundamental premise opposed by neoclassicists: that economics cannot be separated from the political and social system within which it is embedded.

²² MacAvoy, Paul W. 2007. *The Unsustainable Costs of Partial Deregulation*. New Haven & London: Yale University Press.

²³ Goddard, Edwin C. 1934. "The Evolution and Devolution of Public Utility Law." *Michigan Law Review*, 32(5): 577-623.

²⁴ Gray, Horace M. 1940. "The Passing of the Public Utility Concept." *The Journal of Land & Public Utility Economics*, 16(1): 8-20.

²⁵ Melody (2002) refers to this as tuning up markets. Jones (2009) refers to this as regulation to effect public values.

²⁶ Jones, Douglas 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.

²⁷ See Melody, *supra* note 20

²⁸ See, for example, Trebing *supra* note 18 and Miller, *supra* note 19.

monopolies in the early 1900s²⁹. In effect, the concept developed from a confluence of public outcries over the exploitation of market power and of courts grappling with pressures by special interests for government intervention to alter the flow of economic rents.

(1) Railroads often faced little competition in the 1800s. Their primary rivals – canals and rivers – possessed serious disadvantages compared to railroads once the technology began to mature. Also, competition between railroads was limited. Governments were involved heavily in the development of individual railroad companies – including the planning and design of routes, constructing rights of way, granting charters, providing land, and granting some powers of eminent domain – leading to geographic market segmentation. Railroads also engaged in collusive practices, such as price fixing. When competition did emerge, the rivalry took the form of cutthroat competition that created volatile earnings and led to industry consolidation. Market power allowed railroads to engage in unusually granular price and service discrimination that left customers with little economic surplus. Politicians reacted to the resulting public outcry by experimenting with various modes of regulation, eventually settling upon the establishment of independent regulatory agencies, such as the Interstate Commerce Commission and state railroad commissions, who held varying degrees of authority over prices and services. Although no longer considered utilities, railroads were the first businesses to be categorized as such^{30,31}.

(2) The phenomenon in which courts identified certain firms as being affected with the public interest evolved in the late 1800s and early 1900s.³² The effective starting point was an 1876 case, *Munn v. Illinois*, involving Illinois grain elevators that the U.S. Supreme Court found were situated uniquely between a river harbor and railroad tracks. The grain elevators' location gave them control over grain movements from farmers in certain Midwestern states to markets on the East coast³³. It was virtually impossible to move either the harbor or the rails, so the elevators were “virtual monopolies” for storing and transferring grain coming from the “seven or eight great States of the West.”³⁴ Customers of the elevators asserted that the elevators had market power and exerted it in a way that hindered the economic well being of farmers and others. In developing its foundation for deciding on behalf of the plaintiffs, the Court found that the elevators exercised “a sort of public office” and stood at the “gateway of commerce” because of their unique position that made farmers dependent on the elevators and without alternatives if grain was to be moved from the Midwestern states to the East. The Court concluded that it was proper for governments to use their policing powers to control the conduct of such businesses whose actions had such broad consequences, making them affected with the public interest³⁵.

Within a short time courts liberally expanded on the types of businesses that could be regulated because, in the option of those courts, the businesses were affected with the public

²⁹ Trebing, *supra* note 18

³⁰ Goddard, *supra* note 23

³¹ Trebing, *supra* note 18

³² See Glaeser, *supra* note 13, Goddard, *supra* note 23, Trebing *supra* note 18, and Cherry, Barbara A. 2003a. “The Political Realities of Telecommunications Policies in the U.S.: How the Legacy of Public Utility Regulation Constrains Adoption of New Regulatory Models.” Michigan State DCL Law Review, 2003(3): 757-790.

³³ Goddard, *supra* note 23

³⁴ *Munn v. Illinois*, 94 U.S. 113, 130-132 (1876).

³⁵ Trebing, *supra* note 18

interest. At various points courts included grain elevators that possessed no market power, news publishing, cotton presses, tobacco warehouses, insurance, resale of theater tickets, and the sale of ice (Goddard 1934)³⁶. This expansion of regulation constituted a paternal view of the role of government, i.e., one in which the government should put its finger on the scales of commerce to favor some parties or disadvantage others – a form of rent seeking by certain stakeholders³⁷ - rather than the policing role envisioned in *Munn*. If the Court’s initial view in *Munn* was to prevail, there was a need to reign in the manner in which lower courts were defining “affected with the public interest.”

In a step in that direction, the Court in *Chas. Wolff Packing Co. v. Court of Ind. Relations* (1923) identified firms affected with the public interest as being of three possible types:

(1) Those which are carried on under the authority of a public grant of privileges which either expressly or impliedly imposes the affirmative duty of rendering a public service demanded by any member of the public. Such are the railroads, other common carriers and public utilities. (2) Certain occupations, regarded as exceptional, the public interest attaching to which, recognized from earliest times, has survived the period of arbitrary laws by Parliament or colonial legislatures for regulating all trades and callings. Such are those of the keepers of inns, cabs, and gristmills. (3) Businesses which, though not public at their inception, may be fairly said to have risen to be such and have become subject in consequence to some government regulation. They have come to hold such a peculiar relation to the public that this is superimposed upon them. In the language of the cases, the owner, by devoting his business to the public use, in effect grants the public an interest in that use and subjects himself to public regulation to the extent of that interest although the property continues to belong to its private owner and to be entitled to protection accordingly.³⁸ (Cites omitted.)

Glaeser³⁹ explains that the Court’s third category is relevant to the public utility concept. This category was meant for the firms at the gateway of commerce, such as the Illinois grain elevators, although the first category clearly is meant also to capture public utilities. Glaeser further points out the importance of the word “peculiar,” noting that all businesses affect the public welfare and the only sensible way to understand the third category is to consider that firms affected with the public interest have a special or peculiar relationship to the public.

Corroborating Glaeser’s interpretation of the Court’s meaning of “affected with the public interest”, in *Phillips Petroleum*⁴⁰ “the Court moved toward two fundamental tests: (1) the potential for exploitation or extortion, and (2) the degree to which the service could be construed as a necessity”⁴¹. These tests remain foundational for the public utility concept. The first test implies that the enterprise must be a monopoly in the sense that it provides 100% of the output for the market, that the firm’s monopoly service has no close substitutes, and that the monopoly

³⁶ See Trebing, *supra* note 18, and Goddard, *supra* note 23

³⁷ Posner, Richard. 1971. “Taxation by Regulation,” *Bell Journal of Economics* 2:22-50.

³⁸ *Chas. Wolff Packing Co. v. Court of Ind. Relations*, 262 U.S. 522, 535 (1923). Citations omitted.

³⁹ Glaeser, *supra* note 13

⁴⁰ *Phillips Petroleum Co. v. Wisconsin*, 347 U.S. 632 (1954).

⁴¹ Trebing, *supra* note 18

status endures over time. Bonbright goes further to conclude that the enterprise must be a natural monopoly in the sense that the firm “cannot be operated with efficiency and economy unless it enjoys a monopoly of its market”⁴², although customers may have options at the margin, such as self-supply through co-generation or small generators in the case of electricity. For the enterprise to be able to exploit or extort, there can be no close substitutes for the monopoly’s product or service⁴³ and there must be barriers to entry so that the monopoly’s status persists over time^{44,45}.

The Court’s second test in *Phillips Petroleum*, namely the enterprise’s service being construed as a necessity, means that it is insufficient for a firm to simply be a monopoly or simply possess market power; the firm’s conduct must have significant economic consequences, such as effectively closing down some portion of an economy in the case of the firm’s failure or extracting nearly all the economic rents. The Illinois elevators were a gateway of commerce because grain could not move from producers to consumers without passing through the elevators⁴⁶. It is insufficient that the enterprise provides a valuable service or that customers have grown dependent on the service. Rather, there must be some external factor, such as geography or a technology limitation that provides the enterprise with its unique position in the economy.

(3) The third factor leading to the development of the public utility concept, namely the acceptance of the idea of natural monopoly, emerged in the early 1900s. The first enterprise to embrace it was AT&T in 1908 when its CEO announced that telephony in the United States should be “One Policy, One System, Universal Service.”⁴⁷ The U.S. Securities Exchange Commission applied the natural monopoly concept to energy utilities under the Public Utility Holding Company Act (1935), when “it sought to implement the natural monopoly concept by replacing holding company empires with independent, vertically integrated electric and gas utilities serving a specific geographic market”⁴⁸.

The most common approach to determining whether a firm is a natural monopoly is to examine the market from a production technology perspective.⁴⁹ By this view, a monopoly is a natural monopoly if a single firm represents the least cost arrangement for serving the entire relevant market demand⁵⁰. When the natural monopoly concept was developed, utilities were

⁴² Bonbright, James C., Albert L. Danielsen, and David R. Makerschen. 1988. *Principles of Public Utility Rates*. Arlington, VA: Public Utilities Reports, Inc.

⁴³ Werden, Gregory J. 1998, “Demand Elasticities in Anti-trust Analysis.” *Antitrust Law Journal*, 66: 363-414.

⁴⁴ Harris, Barry C., and Joseph J. Simons. 1989. “Focusing Market Definition: How Much Substitution is Necessary?” *Research in Law and Economics*, 12: 207-226.

⁴⁵ Hovenkamp, Herbert, and Phillip E. Areeda. 2011. *Fundamentals of Antitrust Law*, Fourth Edition. New York, NY: Aspen Publishers.

⁴⁶ Goddard, *supra* note 23

⁴⁷ “Milestones in AT&T History,” AT&T <http://www.corp.att.com/history/milestones.html>, accessed December 30, 2012. Trebing (2001) states that AT&T embraced natural monopoly in 1910. He might be using another event as marking AT&T’s acceptance of natural monopoly, but he does not elaborate.

⁴⁸ Trebing, *supra* note 18

⁴⁹ There is at least one other approach, namely to define a firm as a natural monopoly if a single firm represents the only market structure that can receive non-negative profits. This approach does not lend itself to empirical testing because it lacks specific properties of costs, demand, and other factors that lead to such an outcome. Falling into this view, however, would be the notion of destructive competition, which is the idea that an industry with high fixed costs and homogenous products will tend to experience price wars that drive firms out of business until only one is left. See Hovenkamp, *supra* note 45 and Tirole, Jean. *The Theory of Industrial Organization*. Cambridge, MA: MIT Press.

⁵⁰ Sharkey, William W. 1982. *The Theory of Natural Monopoly*. New York: Cambridge University Press.

single product firms and if they faced competition, the rivals also were single product firms using the same or similar technologies. As a result, economies of scale and wasteful duplication of facilities were the primary economic concepts for determining whether a firm was a natural monopoly⁵¹, and it was easy to conclude that an electric utility with large generating plants or a telephone utility with a single line to each residence was a natural monopoly⁵².

Over time, some specialized technologies for utility services gave way to GPTs, making it possible for traditional utility services to be bundled with other services⁵³. Such bundling of services made it clear that the concept of a natural monopoly was more complicated than originally constructed, which triggered investigations into the determinants of natural monopoly. Baumol⁵⁴ found that economies of scale were insufficient and unnecessary for natural monopoly and developed conditions for natural monopoly in multiproduct firms. Jamison⁵⁵ added that to be a natural monopoly, a firm must represent the least cost arrangement for serving the entire market demand for own products and must have dominant cost subadditivity for these products, in any combination, than firms outside of its markets.⁵⁶ Jamison explained that analysts examining markets for natural monopoly might overstate the number of markets that are actually natural monopolies because research is necessarily limited to technologies already in use⁵⁷. These technologies would likely appear to have natural monopoly properties if used by a monopoly, causing researchers to miss the economics of alternative technologies that may be more efficient and not possess the production characteristics necessary for natural monopoly.

Clearly the public utility concept was born of relevant public and private concerns and was analyzed frequently by the courts and by economists from its inception. It therefore is reasonable to continue to question the validity of the concept as technology, industry, and government transform over time.

B) Common Carrier Concept

The common carrier concept, which is the grounds for regulating carriers such as railroads and trucking companies, is based on the English common law concept of “public callings” that developed during medieval times and has been refined over the years as a basis for determining when government regulation is justifiable. The public callings concept has been at times intertwined with the concept of an enterprise being affected with the public interest and so provides part of the foundation for public utility regulation as well as that for common carrier

⁵¹ *Id.*

⁵² Wyman, Bruce. 1904a. “The Law of the Public Callings as a Solution of the Trust Problem.” *Harvard Law Review*, 17(3): 156-173.

⁵³ MacAvoy, *supra* note 22

⁵⁴ Baumol, William J. 1977. “On the Proper Cost Tests for Natural Monopoly in a Multiproduct Industry.” *American Economic Review*, 67(5): 809-822.

⁵⁵ Jamison, Mark A. 1999. *Industry Structure and Pricing: The New Rivalry in Infrastructure*. Boston: Kluwer Academic Publishers.

⁵⁶ Subadditivity is defined as being less costly for a firm to produce a given level of output than for all possible combinations of two or more firms to produce that output (Sharkey 1982, p. 2). Dominant cost subadditivity extends this concept by requiring that the monopoly in question provides economies of joint production greater than economies that could be provided by all other forms of organization that might produce some portion of the output of the monopoly in conjunction with products and/or markets that the monopoly does not supply. (Jamison 1996, p. 92).

⁵⁷ Jamison, *supra* note 55

regulation (Baldwin 1959, Indiana Law Review 1933)^{58, 59}. Indeed some authors have concluded that the definition of a public calling is identical to that of an enterprise affected with the public interest: namely that the firm is a virtual monopoly and that the firm's service is indispensable (Indiana Law Review 1933). Some authors, notably Cherry⁶⁰, draw clear distinctions between public utility and common carrier concepts.

Courts around medieval times classified enterprises as public callings when they were virtual monopolies. Inns, for example, were public callings because each village had but one, and if the enterprise refused someone service, the person would have to travel miles in dangerous conditions to find another inn.^{61,62} Being a physician was a public calling if there was only one in the village and being denied treatment could result in a person's death. Likewise enterprises that carried goods between villages were public callings called common carriers because there was no competition for such transit and it was too costly and too dangerous for an individual to carry his or her own freight and traverse the long paths that connected communities. Common carriers were obligated to provide service, given the monopoly status, because to deny service was to deny someone an opportunity for trade. Common carriers also were obligated to charge a standard price so that the enterprises could not engage in economic coercion and exploitation that the monopoly status made possible. The regulation subjected such businesses to the just price doctrine, which required that prices reflect the service's value for the community in general; prices based on unique circumstances of specific buyers or sellers were not allowed (Baldwin 1959)^{63,64}. These principles became embedded in U.S. law regarding common carriers because of market power abuses by railroads in the 1800s and because the railroads were granted special privileges by the government⁶⁵. The principles were applied to telecoms because the companies were classified as common carriers by statute and initially were regulated by commissions that previously had been set up to regulate railroads.

Levin and Schmidt assert that the notion of common carrier remains relevant to telecoms⁶⁶. They explain that the least market-intrusive remedies for potential market power abuses are appropriate, but maintain that there remain "candidates" for regulatory intervention. Among these candidates are consumers in areas with no competition for voice or data services; consumers relying on the carrier-of-last-resort or obligation to serve policies; and situations in which rules are needed to pursue social goals. These candidates for regulation largely reflect the

⁵⁸ Wyman, *supra* note 52

⁵⁹ Wyman, Bruce. 1904b. "The Law of the Public Callings as a Solution of the Trust Problem. II." Harvard Law Review, 17(4): 217-247.

⁶⁰ Cherry, *supra* note 16

⁶¹ Stigler, George J. 1971. "The Theory of Economic Regulation," Bell Journal of Economics and Management Science, 2:3-21.

⁶² This example illustrates that the definition of public calling and being affected with the public interest can change over time; sometimes, for reasons that are self-serving to special interests (Posner, *supra* note 36 and Stigler, *supra* note 61). It is because of this latter reason that it is important to anchor such definitions or classifications.

⁶³ Cherry, *supra* note 16

⁶⁴ Wyman, *supra* note 52

⁶⁵ Cherry, *supra* note 16

⁶⁶ Levin, Stanford, and Stephen Schmidt. 2010. "Telecommunications after Competition: Challenges, Institutions, Regulation." Info, 12(2), pp.28– 40.

ideas embedded in the common carrier laws, although the vagueness of the social goals justification appears to be a candidate for Posner's taxation by regulation⁶⁷.

C) Instruments of Public Utility and Common Carrier Regulation

Governments subject common carriers and public utilities to a greater degree of regulation than general businesses. Governments require that such enterprises obtain special licenses, franchises, or certificates to be allowed to provide services and the service territories may be exclusive, meaning that the government has granted the utility a monopoly in a particular geographic region for the services specified. Often the franchise or other permission instrument comes with exit restrictions and with a positive obligation to serve each customer in the service area under the same terms and conditions as offered to other similarly situated customers, thus giving the government the power to control the degree of price or service discrimination in which the enterprise can engage. Service quality is regulated and consumer protection often is included. Subsidies could be built into prices or provided explicitly, often for the purpose of ensuring service affordability for some customers, but at other times simply as a means for benefitting some customers at the expense of others. The regulation of prices also includes mechanisms for ensuring that utilities have an opportunity to recover costs that regulators consider prudently incurred^{68,69}. Sometimes the justification for regulation that priced network access below economic cost was to advance the social benefit of universal access; however, the price elasticity of demand for network access is as close to zero as can be measured econometrically⁷⁰. This result suggests that continued regulation in pursuit of the social goal of universal access is no longer advisable, if it ever was⁷¹.

D) Application to Communications Networks

Based on the lessons of history, we conclude that the determination of whether an enterprise should be considered a public utility, a common carrier, both, or a private calling (as opposed to public calling) centers on three questions: (1) Is the enterprise a monopoly? (2) Does the business exploit its monopoly position to extract extra rents (there is no need to regulate a firm if the regulation has no impact on performance)? (3) Is the firm's product a necessity, equivalent in its importance to a gateway of commerce? The enterprise must pass all three tests for public utility or common carrier regulation to be appropriate.

Based on this traditional role for sector regulation, we assert that communications should not be considered a common carrier service, but that certain elements of networks may be public utilities. With perhaps only a few exceptions in rural areas of the United States, network providers face competition. There may be argument over the degree or effectiveness of competition, but the threshold triggering regulation is quite high (or low, depending on one's perspective), namely that the firm must be a monopoly for all practical purposes with the market

⁶⁷ Posner, *supra* note 37

⁶⁸ Cherry, *supra* note 16

⁶⁹ See Melody, *supra* note 20, MacAvoy, *supra* note 22, Goddard, *supra* note 23, Cherry, *supra* note 16

⁷⁰ Hausman, Jerry A., Timothy J. Tardiff, and Alex Belinfante. 1993. "The Effects of the Breakup of AT&T on Telephone Penetration in the United States." *American Economic Review*, 83(2), 178-184.

⁷¹ Mueller, *supra* note 8.

power to extract almost all economic surplus from its customers. As noted by Kahn, “[t]he industry is obviously no longer a natural monopoly and wherever there is effective competition – typically and most powerfully, between competing platforms – land-line telephony, cable and wireless – regulation of the historical variety is both unnecessary and likely to be anticompetitive”⁷². Adding to this the requirement that the firm must be exploiting its market position, it seems clear that communications network providers in the U.S. should not be considered public utilities or common carriers.

We note: this is not to say that there may not be elements of telecommunications that should be considered public utility in nature. A radio tower may be a public utility when uniquely situated such that no one can provide network services without use of the tower. This does not appear to occur in the United States where it made commercial sense for mobile telephone providers to spin off their tower businesses, but regulators in other countries have found towers to be a bottleneck used by network operators to limit competition.

The same may be said for conduit or other rights of way, or building or community access. An entity that controls a right of way or gateway through which a network provider must pass to provide network service could be considered to be providing a public utility service. For example, owners of multitenant buildings and developments sometimes have monopoly control of network access⁷³. We stress that it is insufficient to be a monopoly in towers or in conduit if competition exists between transmission via airwaves and transmission via fiber or wire. The monopoly power must extend to all gateways such that the enterprise is able to deny the supply of network service by denying access to the gateway.

Our conclusions are consistent with those of others who question the role of regulation on communications networks. Weisman offers eight regulatory principles that he believes must be adhered to by policymakers in order for any telecommunications regulatory policy to be optimal⁷⁴. These principles are consistent with economic rationale, and reflect historical events as well. For example, Weisman points out that “the FCC has at times confused protecting competitors with protecting the integrity of the competitive process”⁷⁵. Still, these principles follow his stated necessary conditions for market intervention, which loosely translated are the existence of market failure, and appropriate cost-benefit analysis of any government regulatory intervention. Our argument mirrors Weisman’s statement:

“The rapid rate of technological change in the telecommunications industry over the last decade has fundamentally transformed the industry’s market structure. The multiplicity of competitive platforms, including broadband and wireless, represents a metamorphosis of seemingly unprecedented proportion. This paradigm shift necessarily calls for a re-examination and recalibration of the industry’s regulatory institutions”⁷⁶.

⁷² Kahn, Alfred. 2007. Network Neutrality. Washington D.C.” AEI Brookings Joint Center for Regulatory Studies, Working Paper RP07-05. Accessed 5/28/13: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=973513.

⁷³ Holt, Lynne and Mark Jamison. 2008. “Federal Regulation and Competitive Access to Multiple-Unit Premises: More Choice in Communications Service?” *Journal on Telecommunications and High Technology Law*, 6(2): 425-454.

⁷⁴ Weisman, Dennis L. 2010. “A ‘Principled’ Approach to the Design of Telecommunications Policy,” *Journal of Competition Law and Economics*, 6(4), 927-956.

⁷⁵ *Id.*

⁷⁶ *Id.*

Mayo similarly asserts that the historical principal drivers of regulation are unable to provide a strong foundation for regulatory policymaking going forward⁷⁷. He provides an overview of the evolution of regulation and advocates what he terms ‘results-based regulation’, which relies on empirical analysis and principles. In agreement with our research, Mayo acknowledges the effect of technological changes in the telecommunications industry and advocates regulatory mechanisms that evolve with the industry. He also draws attention to the evolution of legal institutions that ideally should complement regulatory mechanisms.

Similarly Hausman and Taylor note that historically when regulators, courts, and legislators determined regulatory and industry parameters, they acted on their view of how telecommunications competition *should* evolve⁷⁸. When such competition failed to evolve as anticipated, “the resulting chaos mislead investors, delayed innovations, and cost consumers billions of dollars.”

Levin and Schmidt argue that regulation is appropriate for networks in limited situations, such as where there is no competition, where interconnection agreements could facilitate tacit collusion, and where service is too costly to be commercially viable⁷⁹.

Having explained why the traditional public utility and common carrier classifications no longer apply, we address two new ideas: general purpose technologies and special infrastructure.

III. GENERAL PURPOSE TECHNOLOGIES

Bresnahan and Trajtenberg⁸⁰ define GPTs as having the following three characteristics: pervasiveness, potential for technical improvement, and innovational complementarities. They elaborate by stating that GPTs are characterized by “innovational complementarities”; in other words, “the productivity of R&D in a downstream sector increases as a consequence of innovation in the GPT,” thereby “magnify[ing] the effects of innovation in the GPT, and help[ing to] propagate them throughout the economy.”⁸¹ More simply stated, innovation should generate positive externalities in downstream industries due to the open-ended nature of the technology. For example, the introduction of electric motors in manufacturing created a direct impact on industry by reducing energy costs; additionally, electric motors generated an indirect impact by leading to more efficient factory designs that could take advantage of the flexibility that electric motors afford.

Jovanovic and Rousseau (2005, pp. 1203-1204) use Bresnahan and Trajtenberg’s definition to test whether electrification and information technology meet the required characteristics, and they add less direct characteristics based on economic theory: productivity should slow; skill premium should rise; entry, exit, and mergers should rise; stock prices should fall (initially); young and small firms should do better; and interest rates should rise⁸². The

⁷⁷ Mayo, John W. (2013). “The Evolution of Regulation: Twentieth Century Lessons and Twenty-First Century Opportunities”, *Federal Communications Law Journal*, 65(2), 119-156.

⁷⁸ Hausman, Jerry A. and William E. Taylor. 2012. “Telecommunication in the US: From Regulation to Competition (Almost)”. *Review of Industrial Organization*, 42, 203-230.

⁷⁹ Levin and Schmidt, *supra* note 66

⁸⁰ Bresnahan and Trajtenberg, *supra* note 11

⁸¹ *Id.*

⁸² Jovanovic, Boyan, and Peter L. Rousseau. 2005. “Chapter 18; General Purpose Technologies”, in *Handbook of Economic Growth*, Volume 1B. Ed. Philippe Aghion and Steven N. Durlauf, Elsevier.

authors conclude that they have illustrated that the concept of GPTs is a good way to organize how researchers think about technological change and the effects.

The basic idea of both studies mentioned prior, is that externalities play a primary role in these technologies. Therefore, to consider the applicability of the concept of GPTs to telecommunications, we first must address the concept of externalities. In the case of GPTs, we can define externalities according to the standard microeconomic concept, whereby a downstream firm that has no control over an upstream firm or how that firm chooses to innovate has its output affected directly by the upstream firm. A positive externality exists when a firm making a decision does not receive the full benefit of the decision, so that the benefit to the firm is less than the benefit to society. With positive externalities, less is produced and consumed than the socially optimal level.

Communications networks may exhibit such externalities, and also have the potential for network externalities. A network externality is a network effect that is not internalized by market participants⁸³. Communications networks are characterized by network effects, meaning that the value of the network depends on participation of customers and suppliers in the physical, virtual, or social network.⁸⁴ For example, a phone essentially is useless when only one person has one. Similarly, *Google Play* has more value with multiple customers and application suppliers. As more people begin to use cell phones or Google Play, the utility derived by each user increases as each has access to an increasing network of people and suppliers.

While communications technologies may fit the definition of GPTs, communications networks deviate from the definition developed by Bresnahan and Trajtenberg⁸⁵ in one important sense: GPTs are characterized by quality improvements that are general in nature, treating all downstream customers basically the same. This is not true for communications networks. Indeed many regulatory policies over the years have been designed specifically to try to make communications services more homogeneous. These include the FCC's computer inquiries,⁸⁶ certain line of business restrictions in the decree breaking up AT&T,⁸⁷ and net neutrality. The adoption of these and other regulatory restrictions demonstrate that at least some government officials and telecommunications company rivals believe that communications networks will provide different services and service qualities to different customers, absent regulatory restrictions.

⁸³ Liebowitz, Stanley J. and Stephen E. Margolis. 2002. "Network Effects." In *Handbook of Telecommunications Economics, Volume 1: Structure, Regulation, and Competition*, eds. Martin E. Cave, Sumit K. Majumdar, and Ingo Vogelsang, 76-96. Amsterdam: North-Holland.

⁸⁴ Eric P. Chiang, *Core Economics "Global Networks" chapter*, (New York: Worth Publishers, 2008), pp. 5-7.

⁸⁵ Bresnahan and Trajtenberg, *supra* note 11

⁸⁶ Regulatory & Policy Problems Presented by the Interdependence of Computer & Communications Services & Facilities, 28 FCC 2d 291 (1970); 28 FCC 2d 267 (1971), *aff'd in part sub. nom. GTE Service Corp. v. FCC*, 474 F.2d 724 (2d Cir. 1973), decision on remand, 40 FCC 2d 293 (1973); Notice of Inquiry and Proposed Rulemaking, 61 FCC 2d 103 Supplemental Notice of Inquiry and Enlargement of Proposed Rulemaking, 64 FCC 2d 771; Tentative Decision and Further Notice of Inquiry and Rulemaking, 72 FCC 2d 358; and 77 F.C.C.2d 384; and In the Matter of Amendment of Section 64.702 of the Commission's Rules and Regulations (Third Computer Inquiry), 104 FCC 2d 958 (1986).

⁸⁷ In 1982, the Antitrust Division of the U.S. Department of Justice and AT&T agreed to enter into a consent decree to settle the government's antitrust suit against AT&T. This decree would, among other things, restrict the divested Bell Operating Companies from offering information services. See *United States v. Western Electric Co.*, 552 F. Supp. 131 (D.D.C. 1982) (Modification of Final Judgment or MFJ), *aff'd sub nom. Maryland v. United States*, 460 U.S. 1001 (1983) (approving MFJ); *United States v. AT&T*, 569 F. Supp. 1057 (D.D.C. 1983) (Plan of Reorganization), *aff'd sub nom. California v. United States*, 464 U.S. 1013 (1983) (approving Plan of Reorganization).

IV SPECIAL INFRASTRUCTURE CONCEPTS

The concept of special infrastructure builds on the idea of GPTs and carries with it a specific call for regulation. The concept, as defined by Frischmann, states that special infrastructure is uniquely important because it provides a foundation for many modern endeavors and is characterized by positive externalities (“spillovers”)⁸⁸. Proponents hold that regulation is important because special infrastructure is a necessary part of modern life. Frischmann asserts that the state of infrastructure in the developed world is mediocre, and both governments and private markets face a constant struggle to provide and maintain it at the quality and quantity that society requires⁸⁹. He further states that special infrastructures are a prerequisite for economic and social development. According to this argument, previous public policy treatments of special infrastructure have ignored the demand-side issues that affect how and when infrastructure is created and maintained. The demand-side focus emphasizes that special infrastructure creates social value over and above private value because of downstream positive externalities. It is for this reason that proponents advocate a commons management approach to special infrastructure; i.e., managing special infrastructure as a commons may be socially desirable because it would enhance downstream productive activities. This appears to ignore economic incentives to create the special infrastructure.

In special infrastructure, commons management implies communal ownership, a defined group of users, and some degree of exclusivity (a division between members and non-members). By Frischmann’s definition the resource is accessible to all members of the community on nondiscriminatory terms. The nondiscriminatory aspect of this definition is crucial to the idea that downstream positive externalities require special treatment so that supplies and quality are adequate.

Accepting for sake of argument that special infrastructure should be provided under this policy framework, markets for communications networks would need to satisfy three conditions to qualify as special infrastructure:

1. The resource may be consumed non-rivalrously for some appreciable range of demand.
2. Social demand (i.e., value derived from downstream positive externalities) for the resource is driven primarily by downstream productive activity that requires the resource as an input.
3. The resource may be used as an input into a wide range of goods and services, which may include private goods, public goods, and social goods.⁹⁰

Communications networks do not fulfill these requirements. First, demand for communications is rivalrous. Frischmann argues that once capacity is installed, it is available for use at almost zero marginal production cost. But all products have zero marginal cost once they are constructed, and the real test for cost is during the planning and production stages, not the post-production stage. Furthermore, today’s communications networks are packet based, meaning that the networks have multiple nodes and links, each with their own costs and capacity, so that packets traversing the networks have multiple opportunities to find bottlenecks and compete for capacity. Finally, even if there are times when a network is largely idle and packets

⁸⁸ Frischmann, *supra* note 10

⁸⁹ *Id.*

⁹⁰ Private goods are characterized by being rival and excludable in consumption; public goods are non-rival and non-excludable in consumption. Frischmann defines a social good as any good that has positive externalities.

do not find capacity constraints, communication during these times does not necessarily represent demand independent from all other times. The “appreciable range of demand” criteria implicitly assumes that customer demand during non-capacity constrained times is unrelated to demand during constrained times, but in reality individual customers use communications networks at both times, such that demand is correlated across time.

Secondly, while telecommunications is indeed an input for many downstream social and economic activities, it is not necessarily undersupplied, which is the logical extension of the assertion that social demand is greater than private demand. The special infrastructure idea maintains that the importance of the infrastructure is critical to economic growth and social welfare, but that the private market does not allow providers to capture enough downstream economic rents to provide sufficient socially desirable quantities and qualities. This argument however is flawed. The argument rests on an assumption that communications networks cannot discriminate with respect to price and quality. But as we have shown above, absent regulation, these networks can do both. Even if that were not true, the argument implicitly assumes that communications networks as an input are unique in their failure to capture downstream rents. But if there are downstream positive externalities, then all inputs – not just communications networks – are failing to capture this surplus, which would imply that all inputs are undersupplied. If this were true it might mean that the economy in general invests more in downstream production than is socially optimal, but it is not a sufficient argument for regulating communications networks as commons.

While the idea of a commons management approach to infrastructure resources generating a cascade of positive externalities sounds optimistic, there is little hope of testing the veracity of this claim empirically. Furthermore, it is difficult to see a way in which these ideas could apply to the telecommunication industry and the generation of network externalities. Network effects can be internalized so that supply and value should be expected to remain largely unenhanced by a change from market-oriented supply to a commons management approach⁹¹.

IV. CONCLUSION

There are many reasons regulation may arise. In some instances the government may require firms to provide a service that the government could fund through taxes, but using the firm helps politicians avoid imposing unpopular taxes. Politicians might impose regulation to satisfy rent-seeking stake-holders who pursue regulations that benefit themselves at the expense of others. In contrast to these more arbitrary impositions of regulations, government controls might arise because experience has indicated that certain types of enterprises, left to their own devices, develop market structures and/or engage in conduct that negatively impact the development of significant portions of the economy, for example, the conduct of the monopoly grain elevators in *Munn v. Illinois*.

Public utility regulation and common carrier regulation developed in this latter framework because the enterprises’ monopoly market structures propensity to charge monopoly prices and engage in extensive price discrimination, and peculiar relationships to customers, fit a historic pattern in which regulation could improve economic performance. We examine these historic characteristics of firms affected with the public interest and find that they do not apply to today’s telecommunications industries in the United States and so do not provide justification for

⁹¹ Liebowitz and Margolis, *supra* note 83

regulation: Telecommunications carriers have largely lost their monopoly status and any remaining bottlenecks in their operations or facilities, such as uniquely situated physical access facilities, can be more properly viewed as public utilities.

We also address two recently developed categories of enterprises that have been offered as justification for regulation, namely GPTs and special infrastructure. We do not provide general critiques of whether the enterprise characteristics used to define these categories are indeed adequate reasons for special regulation; rather, we examine whether telecommunications operators fall into these categories in a way that would justify regulation. We find that they do not because telecommunications firms do not have the assumed cost characteristics of special infrastructure and do not do not exhibit a differentiating amount of social demand.