

Economic Policy Vignette

Regulation and Investment: Sk(r)ewing the Future for 21st Century Telecommunications?

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A careful reading of the economic literature as well as an examination of observed investment patterns in the face of regulatory changes reveal that, independent of any impact regulation may have on the *level of investment*, the imposition of additional regulation may alter the *mix of investments*. Importantly, the resulting distortions to the mix of investment may be as harmful to consumers and the future of the telecommunications industry as are impacts on the level of investment. In the dynamic telecommunications market, which relies heavily on private-sector investment,¹ regulators and policymakers must be keenly aware that their policy decisions can affect not only the level of investment but can also skew investment decisions. Such skewing of investment across firms, technologies, or geographic areas harms economic efficiency and threatens the future economic vitality of not only the industry but also the larger economy.

Level versus Mix of Investments

A great deal has been written in policy circles over the last decade about the relationship or non-relationship between the imposition of regulation and the level of investment by regulated firms in the telecommunications sector.² Most recently, some have argued, in the context of the Federal Communication Commission's (FCC) imposition of common-carrier regulation on broadband providers, that the consequence will be that firms subject to the additional regulation will significantly reduce investments needed to upgrade and expand the digital infrastructure necessary to produce the high-quality, affordable broadband services Americans have come to expect, and that policymakers want to see provided.³ Others have argued that no such effect should be expected or observed.⁴

¹ Private-sector investment in broadband has been calculated to be roughly \$1.4 trillion since 1996. See <https://www.ustelecom.org/broadband-industry-stats/investment/historical-broadband-provider-capex>.

² See, e.g., Alberto Alesina, Silvia Ardagna, Guiseppi Nicoletti and Fabio Schiantarelli "Regulation and Investment," *Journal of the European Economic Association*, June 2005, pp. 791-825; Graeme Guthrie "Regulating Infrastructure: The Impact on Risk and Investment," *Journal of Economic Literature*, December 2006, pp. 925-972; and Michał Grajek and Lars-Hendrik Röller "Regulation and Investment in Network Industries: Evidence from European Telecoms," *The Journal of Law & Economics*, February 2012, Vol. 55, pp. 189-216.

³ See, e.g., Hal Singer "How the FCC Will Wreck the Internet," *The Wall Street Journal*, May 28, 2015, available at: <http://www.wsj.com/articles/how-the-fcc-will-wreck-the-internet-1432857872>. See also Hal

Assessing which narrative is correct is made difficult for a variety of reasons because the degree of regulatory stringency of an industry is just one of numerous factors that affect a company's evaluation of whether and how much to invest at any particular time. Moreover, the empirical challenges that arise in identifying and quantifying the impact of various investment determinants in a typical industry are compounded in a dynamic industry such as telecommunications. In the absence of sophisticated econometric analyses designed to tease out the impact of regulatory changes on the level of investment, analysts have most recently resorted simply to examining year-over-year changes in investment levels to support or refute claims about the impact more or less regulation has on investment. Unfortunately any such inferences are likely to be of uncertain value. For instance, inferences of "no regulatory-induced investment impact" in the presence of observed year-over-year investment increases ignore the counterfactual assessment of what level of investment would have been achieved absent the regulatory change. And while there are compelling intuitive grounds for concluding that more onerous regulation will slow investment, to date the matter remains unresolved on both theoretical and empirical grounds.

Yet, while this debate over the potential relationship of regulation and the level of investment in the broadband sector is crucial, it misses the equally important impact that regulation has in investment-hungry industries. Specifically, a careful reading of the economic literature as well as an examination of observed investment patterns in the face of regulatory changes reveal that independent of any impact regulation may have on the *level of investment*, the imposition of additional regulation may alter the *mix of investments*. Importantly, the resulting distortions to the mix of investment may be as harmful to consumers and the future of the telecommunications industry as are impacts on the level of investment. For example, regulatory changes in the U.S. that provoke U.S. telecommunications companies to make investments outside the U.S. may slow the deployment and therefore adoption of broadband in the United States. Similarly, to the extent regulation drives telecom firms to invest in legacy technologies rather than newer and more capable digital technologies, 21st century digital customers are likely to be harmed.

Singer "ISP Capital Expenditures in the Title II Era (4Q Edition)," available at:

<https://halsinger.wordpress.com/2016/02/24/isp-capital-expenditures-in-the-title-ii-era-4q-edition/>.

⁴ See, e.g., Kate Cox "Did Net Neutrality Kill Broadband Investment Like Comcast, AT&T, Verizon Said It Would?" available at: <https://consumerist.com/2016/02/09/did-net-neutrality-kill-broadband-investment-like-comcast-att-verizon-said-it-would/>.

Regulatory Skewing – An Example

As important as “regulatory skewing” may be for the future of the telecommunications (and other) modern, capital intensive industries, the economic literature regarding the impact regulation has on private investment has focused principally to date on how the stringency of regulation affects the level of investment. In the absence of a substantial body of theoretical and/or empirical research on regulatory skewing, we turn to a simple example drawn from the U.S. freight rail industry at a time of dramatic regulatory change to illustrate this phenomenon. The clarity of the results from the freight rail industry provides a powerful proof-of-concept regarding regulatory skewing, and in so doing highlights an additional valuable reason why U.S. regulators and policymakers should exercise caution in advancing additional regulation into broadband infrastructure services.

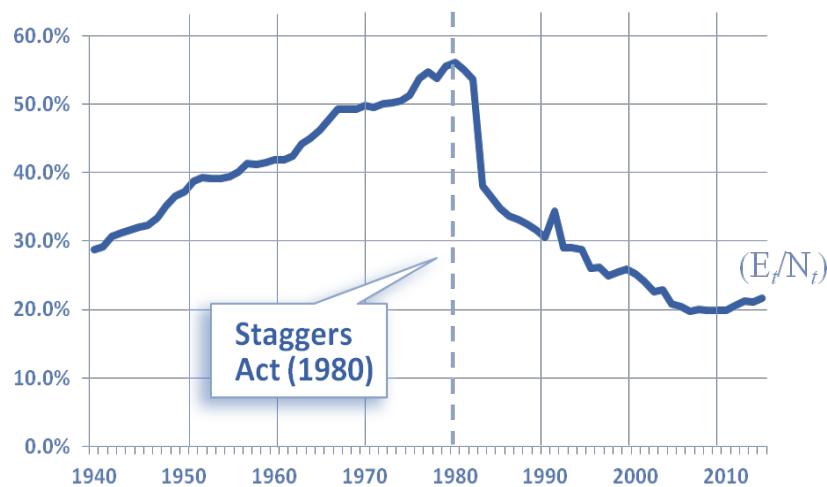
By the 1970s, the U.S. freight rail industry was in dismal condition.⁵ Suffocating, granular regulation of the industry had sufficiently suppressed the investment behaviors of regulated railroads so that an inadequate stock of physical capital restricted their ability to provide even a basic level of freight service. Indeed, the rail infrastructure was so undercapitalized that regulators necessarily established a category referred to as “standing derailments” in which the state of a track structure was so poor that a train – not in motion – simply fell over as the track beneath it gave way.

To be sure, the overall magnitude of industry investment in prior decades had been insufficient, but a simple accounting of total investment spending during the years prior to deregulation hides a more perverse and insidious *skewing* of the investment that took place. Specifically, evidence suggests that the dim future outlook attributable to the regulatory setting in the 1960s and 1970s led railroad management to perhaps rationally, but uneconomically, substitute quantities of equipment *in the place of* railroad track and other vital infrastructure.

⁵ See Robert E. Gallamore and John R. Meyer, *American Railroads: Decline and Renaissance in the Twentieth Century*, Harvard University Press, 2014.

To see this, note that railroads have only two ways to spend capital dollars: they can use those dollars to buy “mobile” equipment (locomotives and freight cars) or they can expend funds to replenish and expand network assets (track, bridges, signals, or terminals). Setting aside the total magnitude of capital spending, Figure 1 isolates the industry-wide ratio (E_t/N_t) of equipment spending (E_t) to network spending (N_t) in the years before and after the adoption of the Staggers Rail Act of 1980, which substantially freed railroads from rate regulation.

Figure 1 – A Comparison of Rail Industry Capital Spending on Equipment and Infrastructure



The picture these data depict is remarkably revealing.

In the years prior to the adoption of the regulatory reform, when the railroad industry’s very survival was imperiled, railroads invested increasingly larger shares of available capital funds in equipment. The seemingly perverse pattern of capital expenditures while the industry was strictly regulated was a direct managerial response to the combined influence of regulatory policies which ballooned the economic and financial uncertainty facing railroads in the period prior to the substantial regulatory reform of 1980. The reaction of railroads to this uncertainty was manifest not only in the level of investments, but also in the mix of investment. In particular, in the face of regulatory uncertainty, firms logically chose to eschew high sunk cost – network – investments relative to lower sunk cost investments in equipment. Unlike track, mobile equipment could be more easily liquidated and could be readily shifted to various parts of a rail network in response to short-run opportunities or need. The consequence was, that while logically responsive to the strict regulatory environment, the mix of investments ultimately was harmful to both consumers and the industry.

After deregulation, however, this trend dramatically reversed. Equipment's share of railroad industry investment spending declined measurably after passage of the 1980 Staggers Rail Act, which substantially freed railroads from rate regulation.⁶ Importantly, it was the post-Staggers correction to this regulatory skewing and in particular the renewed intensity of network assets investments that laid the foundation for improved productivity, lower prices, better consumer service, and the improving financial condition of the industry.

Regulatory Skewing in the Telecommunications Industry

Returning to the telecommunications industry, it is clear that the demands for high speed broadband networks, both mobile and fixed, have grown dramatically in recent years. Simply put, consumers seem to have insatiable desires for high speed, ubiquitous data, voice and video communications. Correspondingly, investments by U.S.- based broadband companies that compete for the patronage of these customers have been prodigious. Within the context of a light-touch regulatory environment, private sector telecommunications companies routinely have invested tens of billions of dollars in infrastructure development and upgrades across a variety of technologies and geographic areas within the U.S.⁷ These investments have created the opportunity for edge providers to develop innovative applications that have, in turn, raised the quality of consumers' personal as well as professional lives. As noted by the FCC, this has provided a virtuous circle of investment, innovation and demand that has proven to be an important driver for the modern U.S. economy.⁸

⁶ While there were other economic changes that may have, to some degree, influenced this picture, its overall form is singularly attributable to ill-considered economic regulation and subsequent regulatory reforms. In particular, in the years following World War II, the railroad industry replaced steam locomotives with diesels, but this transition was complete by the mid-1950s. Similarly, from the 1960s forward, the railroad industry was an early adopter of computer technologies, but that pattern has continued, unabated. Finally, beginning in the early 1970s diesel prices began to exhibit increasing volatility, but that volatility certainly did not end in 1980. Indeed, other than a one-time Interstate Commerce Commission accounting change that coincided with the 1980 Staggers Act, the data depicted in Figure 1 seem free of exogenous influence.

⁷ See, e.g., Seventh Broadband Progress Report and Order on Reconsideration (GN Docket No. 10-159), released May 20, 2011, available at: <https://www.fcc.gov/reports-research/reports/broadband-progress-reports/seventh-broadband-progress-report> noting that "The private sector continues to invest tens of billions of dollars in broadband infrastructure each year – more than \$60 billion in capital expenditures in 2010 alone – expanding capacity, increasing speeds on fixed networks, and rolling out next-generation mobile services like 4G." See also, the historical calculation of broadband provider capital expenditure by USTelecom, available at: <https://www.ustelecom.org/broadband-industry-stats/investment/historical-broadband-provider-capex>.

⁸ See e.g., Statement of FCC Chairman Tom Wheeler Before the Subcommittee on Communications and Technology Committee on Energy and Commerce U.S. House "I'm pleased to report that the information and communications technology sector continues to thrive and drive economic growth and improvements in the lives of the American people. The virtuous cycle is working: the trend of robust investment and innovation in

In light of this sustained private-sector investment in critical broadband access infrastructure during a period of light-touch regulation, consider the lessons of several recent regulatory developments in the telecommunications sphere. Collectively they indicate that even in an environment in which the total levels of investment remain robust, regulatory changes can skew investment decisions across firms, technologies, or geographic areas.

First, consider the impact of regulatory measures that implicitly and/or explicitly impair firms' ability to invest in modern technologies and services that will replace older services. In ordinary businesses, decisions regarding how much to invest in older technologies versus newer technologies as customers migrate to new services is a matter of firm choice. For instance, anticipating the retirement of a particular car model, General Motors may scale back investment in that model and likewise increase investment in a newer model that it believes will better attract consumers. In telecommunications, however, as firms modernize their networks – transitioning from legacy copper networks to Internet Protocol fiber networks – regulators have put pressure on firms to invest in legacy networks. This pressure may forestall truly forward-looking investments. This skewing has been acknowledged in the National Broadband Plan, which notes “Regulations require certain carriers to maintain [Plain Old Telephone Service]—a requirement that is not sustainable—and lead to investments in assets that could be stranded. These regulations can have a number of unintended consequences, including siphoning investments away from new networks and services.”⁹ Similarly, regulatory requirements to maintain older, slower special access lines that are made available to wholesale competitors will have the same effect of skewing investment patterns away from state-of-the arts technologies. This pressure to overinvest in legacy technologies, in combination with the FCC's potential interest in applying a form of rate regulation to specific, fiber-based services, could very well encourage broadband firms to invest less in infrastructure and more elsewhere. The resulting regulatory skewing may fail to be noticed by an examination of the total investment levels made by the firm, yet the distortionary economic consequences of that skewing are very real.

Second, research has demonstrated that regulation of telco-provided DSL broadband access until 2003 and the corollary non-regulation of cable company-provided broadband access demonstrably skewed investment, with cable companies investing

the Internet sector continues; broadband providers are upgrading and building out their network infrastructure, engaging in M&A and increasing speeds to their end-user customers; venture capital is flowing to Internet companies; edge providers are investing and creating new and innovative services; and consumers are reaping the benefits.” Available at: https://apps.fcc.gov/edocs_public/attachmatch/DOC-336448A1.pdf.

⁹ Connecting America: The National Broadband Plan, p. 59. [footnote omitted].

more and telecom firms less in assets to deploy broadband access.¹⁰ Similarly, the FCC's removal of regulations that required fiber-based broadband access services to be unbundled was followed by a substantial shift in the mix of telco investments toward fiber-to-the node or fiber-to-the premises relative to traditional investments in copper-enabled broadband access.¹¹

Finally, consider the decision by AT&T in June 2015 (shortly after the decision by the FCC to significantly tighten regulation of broadband providers in the U.S.) to invest approximately \$3 billion in Mexico. Subsequently, AT&T's 2015 annual report observed that "Mexico is proving to be a great place to invest, with its investment-friendly regulatory environment..." While no definitive cause-and-effect can be linked to the geographic diversification of AT&T's investments and the regulatory environment in the U.S., it is clear from this example that U.S.-based telecommunications providers evaluate investment opportunities globally in light of alternative regulatory paradigms. The potential for U.S.-based regulatory changes to skew the geographic pattern of investment is very real.

In Summary

In the dynamic telecommunications market and in other 21st century markets that depend heavily on private-sector investment, regulators and policymakers must be keenly aware that their policy decisions can affect not only the level but also the mix of firms' investments. In the face of substantially growing consumer demands for broadband-enabled services policymakers and regulators must be especially cautious to ensure that regulatory policies, however well-intentioned, do not sk(r)ew the future of economic welfare for 21st century consumers.

¹⁰ See Thomas W. Hazlett and Anil Caliskan "Natural Experiments in U.S. Broadband Regulation," *Review of Network Economics*, Vol. 7, December 2008, pp. 460-480.

¹¹ Ibid.