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Investment in the Virtuous Circle: Theory and Empirics

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Abstract: In the Telecommunications Act of 1996, Congress directed the Federal Communications Commission to reduce regulation. While the FCC initially made several bipartisan steps in that direction, over the last three presidential administrations the Agency has switched between aggressive and relaxed regulation of broadband services on an explicitly partisan basis, including the imposition of legacy common carrier regulation on broadband services in the name of Net Neutrality. In this POLICY PAPER, a theoretical analysis of the Commission's virtuous circle hypothesis—which drives its Net Neutrality policies—reveals that broadband providers have no apparent incentive to depart from the neutral treatment of traffic. Empirical analysis also finds that the Title II regulatory approach reduced investment by $8.1 billion annually (10%), on average, between 2011 and 2020, or $81.5 billion over ten years, reducing employment in the information sector by about 81,500 jobs and total employment by about 195,600 jobs (many of them union jobs), reducing labor compensation by $18.5 billion annually. Gross Domestic Product ("GDP") has been reduced by $145 billion annually, or $1.45 trillion over ten years. This evidence suggests that the looming threat of Title II regulation that hangs over the industry, during both the regulatory and deregulatory episodes, is a chronic obstacle to infrastructure investment as periods of lighter regulation are perceived as temporary. And this will likely be even worse under the FCC's new *Notice of Proposed Rulemaking*, which is even more far-reaching than its prior Title II proposals.

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I. Introduction

When Congress passed the Telecommunications Act of 1996, it directed the Federal Communications Commission to "reduce regulation in order to … encourage the rapid deployment of new telecommunications technologies."[1] In fact, Section 230(b)(2) specifically states that it is the policy of the United States "to preserve the vibrant and competitive free market that presently exists for the Internet and other interactive computer services, unfettered by Federal or State regulation."[2] While the Commission subsequently took several important deregulatory actions bipartisan, over the last three presidential administrations the Agency has switched between aggressive and relaxed regulation of broadband services on an explicitly partisan basis.

For example, under the Obama Administration the FCC started a deliberate and sustained regulatory revival,[3] including foremost the controversial proposal in 2010 and eventual decision in 2015 to reclassify broadband internet access service ("BIAS") as an interstate telecommunications service, subjecting the service to legacy common carrier regulations designed for the old Ma Bell

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[1].   Preamble, Telecommunications Act of 1996, Public Law 104–104.

[2].   47 U.S.C. § 230(b)(2).

[3]   G.S. Ford, *"Regulatory Revival" and Employment in Telecommunications*, PHOENIX CENTER POLICY PERSPECTIVE No. 17-05 (June 12, 2017) (available at: https://www.phoenix-center.org/perspectives/Perspective17-05Final.pdf).

monopoly under Title II of the Communications Act of 1934.[4] A reprieve of this regulatory revival came during the Trump Administration, when the FCC returned BIAS back to an "information service" under Title I with the *2018 Restoring Internet Freedom Order* ("*RIFO*").[5]

Making no secret of its intentions, the pendulum of aggressive regulation swung back with the Biden Administration.[6] The FCC recently issued a *Notice of Proposed Rulemaking* to subject, once again, broadband internet access services to legacy common carrier regulation under Title II of the Communications Act.[7] Absent congressional action or a conclusive judicial ruling blocking the imposition of Title II regulation, the application of either light- or heavy-handed regulation in telecommunications is now determined every few years in November, leaving broadband providers persistently uncertain about what set of regulatory rules apply to their business and weakening confidence in the nation's regulatory apparatus.[8] Telecommunications investments are long-lived and costly, so this uncertain regulatory environment—and in particular the looming threat of Title II

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[4]   *Protecting and Promoting the Open Internet,* REPORT AND ORDER ON REMAND, DECLARATORY RULING, AND ORDER, 30 FCC Rcd. 5601 (2015) (hereinafter "*2015 Order*"), *aff'd U.S. Telecom Ass'n v. FCC,* 825 F.3d 674 (D.C. Cir. 2016), *reh'g en banc denied* 855 F.3d 381 (2017).

[5]   *Restoring Internet Freedom,* DECLARATORY RULING, REPORT AND ORDER, AND ORDER, 33 FCC Rcd. 311 (2018), *aff'd by, in part, vac'd by, in part, rem'd by Mozilla Corp. v. FCC,* 940 F.3d 1 (D.C. Cir. 2019).

[6]   *President Biden Executive Order on Promoting Competition in the American Economy,* EXECUTIVE ORDER NO. 14036, 86 FED. REG. 36987 (July 14, 2021).

[7]   *Safeguarding and Securing the Open Internet*, FCC 23-83, NOTICE OF PROPOSED RULEMAKING, __ FCC Rcd. __ (rel. October 20, 2023) (hereinafter "*2023 NPRM*") (available at: https://docs.fcc.gov/public/attachments/FCC-23-83A1.pdf).   In addition, the FCC imposed draconian regulatory requirements when it promulgated its final rules to implement the digital discrimination provisions related to Section 60506 of the Infrastructure Investment and Jobs Act of 2021 which will also affect the investment decisions of firms. *Implementing the Infrastructure Investment and Jobs Act: Prevention and Elimination of Digital Discrimination*, FCC 23-100, REPORT AND ORDER AND FURTHER NOTICE OF PROPOSED RULEMAKING, __ FCC Rcd. __ (rel. November 20, 2023) (hereinafter "*Section 60506 Order*") (available at: https://docs.fcc.gov/public/attachments/FCC-23-100A1.pdf)**;** *see also* G.S. Ford and L.J. Spiwak, *Digital Discrimination Under Disparate Impact: A Legal and Economic Analysis*, PHOENIX CENTER POLICY PAPER No. 61 (October 2023) (available at: https://phoenix-center.org/pcpp/PCPP61Final.pdf); T.R. Beard and G.S. Ford, *Digital Discrimination: Fiber Availability and Speeds by Race and Income*, PHOENIX CENTER POLICY PAPER No. 58 (September 2022) (available at: https://phoenix-center.org/pcpp/PCPP58Final.pdf).

[8]   L. J. Spiwak, *The FCC Returns to the Law and Economics Free Zone,* FEDERALIST SOCIETY BLOG (November 20, 2023) (available at: https://fedsoc.org/commentary/fedsoc-blog/the-fcc-returns-to-the-law-and-economics-free-zone).

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regulation—is a serious impediment to investment as periods of lighter regulation are perceived as temporary.[9] With the constant specter of regulation always looming, the investment incentives problem is *chronic*, not acute.[10]

While telecommunications providers continue to invest billions annually in their networks, regulatory excess is a deterrent to infrastructure investment at the margin. Research shows that the initial proposal to regulate broadband as a Title II service in 2010 reduced broadband company stock prices, and subsequent investment in telecommunications infrastructure was below expectations.[11] Regulating broadband services under Title II was eventually codified in 2015, then overturned in 2018, and now it appears common carrier regulation will be formally codified again in 2024 when the FCC issues final rules. The regulatory cloud of uncertainty about the sort and veracity of regulation that will apply to the industry has never lifted; the cycle between light- and heavy-handed regulation has no end in sight. As noted by former FCC Chairman Ajit Pai, ''the specter of

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[9]   G.S. Ford, L.J. Spiwak, and M.L. Stern, *The Broadband Credibility Gap*, 19 COMMLAW CONSPECTUS 75 (2010) (available at: https://scholarship.law.edu/cgi/viewcontent.cgi?article=1517&context=commlaw); E. Teisberg, *Capital Investment Strategies under Uncertain Regulation*, 24 RAND JOURNAL OF ECONOMICS 591-604 (1993); *see also* J. Laffont and J. Tirole, *Should Governments Commit?*, 36 EUROPEAN ECONOMIC REVIEW 345-353 (1992) and P. de Bijl and M. Peitz, REGULATION AND ENTRY INTO TELECOMMUNICATIONS MARKETS (2002) at 246 ("if the regulator cannot pre-commit to such principles, operators face regulatory uncertainty when taking investment decisions. In particular, entrants may start more cautiously to see which regulation applies in the segments with competition to update their beliefs about regulation that will prevail in other market segments. The consequence of such staggered entry is a delay in investment. As a result, the market as a whole matures more slowly, that is, entrants choose a smaller coverage, or roll out a less elaborate network, than without regulatory uncertainty. This increases the need for heavy regulation for two reasons. Firstly, larger parts of the market remain a monopoly; and secondly, regulatory uncertainty favors entry modes in which sunk costs are low. This implies that overall regulatory uncertainty creates a bias in favor of resale-based entry and against facilities-based entry.").

[10]   The Commission appears to imply as much in its *2023 NPRM*. *See 2023 NPRM*, *supra* n. 7 at ¶ 129.

[11]   G.S. Ford, *Net Neutrality and Investment in the US: A Review of Evidence from the 2018 Restoring Internet Freedom Order*, 17 REVIEW OF NETWORK ECONOMICS 175-205 (2018); G.S. Ford, *Regulation and Investment in the U.S. Telecommunications Industry*, 50 APPLIED ECONOMICS 6073–6084 (2018). Some theoretical models show the deleterious effects on investment of Net Neutrality. *See*, *e.g*., M. Bourreau, F. Kourandi, T. Valletti, *Net Neutrality with Competing Internet Platforms*, 63 JOURNAL OF INDUSTRIAL ECONOMICS 30-73 (2015) ("We find that under discrimination, investments in broadband capacity and content innovation are both higher than under net neutrality."). However, the question is an empirical one, though empirical work may be influenced by theoretical results.

Title II reclassification hovers ominously in the background.''[12] Absent conclusive congressional or court action, Title II regulation is ever-present with codification (or abandonment) a mere election away.[13]

Partisan squabbles aside, the actual effect of the Commission's regulatory actions on network investment is an interesting and important question. In this POLICY PAPER, the source of investment effects within the Commission's virtuous circle is analyzed, and then the average effect on investment (and employment) of the uncertainty created by the ongoing Title I/II cycle is estimated. Under a theoretical construction of the virtuous circle consistent with some claims made by proponents of strong regulation (including the Commission), no motivation to impede the workings of the complementarity between the network core and edge is found. Broadband provider profits are higher with a well-functioning edge, so any effect on investment incentives appears related to the risks posed by facing an aggressive and nearly unbounded regulatory regime in the hands of partisan regulators during highly partisan times.

The empirical findings in this POLICY PAPER—coupled with Congress's clearly stated preference for deregulation in the Telecommunications Act of 1996— confirm that Title II regulation is a question of significant economic importance. The persistent prospect of Title II policy reduced investment by approximately 10%, on average, between 2011 and 2020, about $8.1 billion annually, with a total loss of investment over a ten-year period of about $81.5 billion. This reduced investment negatively impacts jobs in the information sector and the broad economy, and indeed it appears there is an annual loss to the nation of about 81,500 information sector and 195,600 total jobs, reducing labor compensation by about $18.5 billion annually, *ceteris paribus*, with many of those jobs being union

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[12] G.S. Ford, *Bait-and-Switch—Or Why the FCC's "Virtuous Circle" Theory is Nonsense*, Bloomberg   BNA   (May   18,   2015)   (available   at: https://www.phoenix-center.org/oped/BloombergBNAVirtuousCircle18May2015.pdf).

[13]   I. Thompson, *Net Neutrality is Back in the Land of the Free – For Now, Until the Democrats Leave Office,   That   Is*,   THE   REGISTER   (October   20,   2023)   (available   at: https://www.theregister.com/2023/10/20/net_neutrality_is_back). If formal rules are desired, then achieving the goals of Net Neutrality is possible under less regulatory regimes. *See*, *e.g.*, L.S. Spiwak, *What Are the Bounds of the FCC's Authority over Broadband Service Providers? – A Review of the Recent Case Law*, 18 JOURNAL OF INTERNET LAW 1 (2015) (available at: https://www.phoenix-center.org/papers/JournalofInternetLawBoundsofFCCAuthority.pdf).

jobs.[14] The loss to Gross Domestic Product ("GDP") is estimated to be $145 billion annually, or $1.45 trillion over ten years.[15]

As the Commission yet again is proposing Title II regulation, one can expect in the future such depressed investment of billions annually relative to a counterfactual. However, the estimates in this PAPER understate the effects of the form of Title II regulation for (at least) two reasons. First, the Biden Administration's proposed reclassification regime is more intrusive than the one the FCC adopted in the *2015 Open Internet Order,* incorporating compliance with Section 214 of the Communications Act into the regulatory paradigm and foreboding prescriptive regulation in other areas, such as network resilience, cybersecurity and privacy. Second, the application of common carrier regulation is now joined with digital discrimination regulation. The Commission's new Digital Discrimination rules are also a threat to economically rational investment decisions and discourage investment.[16] Thus, application of common carrier regulation in the current environment may do more to deter investment than common carrier regulation alone. While the persistent threat and sporadic application of Title II regulation has had significant negative effects on investment and the economy, imposing these additional new regulations, as proposed in the *2023 NPRM* and other regulatory schemes, are likely to cause investment to fall further below expectations.

II. Incentives in the Virtuous Circle

Before turning to the investment question, it is worth contemplating the need for heavy-handed Net Neutrality regulation. Broadband providers have no qualm with the basic principles of Net Neutrality (they adhere to them without regulation), as market forces and consumer expectations incentivize broadband providers to not block, throttle or require paid prioritization based on content.[17] The complaint against Net Neutrality is largely about using Title II common-carrier regulation as a proxy for Net Neutrality. Title II regulation brings with it

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[14]   In 2021-2022, 11.9% of jobs in the telecommunications sector and 10%of jobs in the Information sector were union jobs. *Union Members – 2022*, Bureau of Labor Statistics, News Release (January 19, 2023) (available at: https://www.bls.gov/news.release/pdf/union2.pdf).

[15]   This estimate is based on the historical relationship between GDP and investment in the telecommunications sector.

[16]   Ford and Spiwak, *Digital Discrimination Under Disparate Impact, supra* n. 7.

[17]   This assumes, however, that high-traffic providers do not affect the marginal cost of providing broadband services.

an array of regulatory costs and risks, and it is these costs and risks that appear to worry broadband providers even more than the idea of Net Neutrality.

The Commission's depiction of a "virtuous circle" or "virtuous cycle" in the broadband marketplace is central to its Net Neutrality regulation orders. Indeed, the Commission's *2023 NPRM* invokes once more the virtuous circle as a motivation for common carrier regulation.[18] This virtuous circle hypothesis—which the Commission laid out when it first attempted to implement safeguards without pulling the Title II trigger in 2010—states that there is,

> a virtuous circle of innovation in which new uses of the network—including new content, applications, services, and devices—lead to increased end-user demand for broadband, which drives network improvements, which in turn lead to further innovative network uses. [] These network improvements generate new opportunities for edge providers, spurring them to innovate further. Each round of innovation increases the value of the Internet for broadband providers, edge providers, online businesses, and consumers. [] Restricting edge providers' ability to reach end users, and limiting end users' ability to choose which edge providers to patronize, would reduce the rate of innovation at the edge and, in turn, the likely rate of improvements to network infrastructure. Similarly, restricting the ability of broadband providers to put the network to innovative uses may reduce the rate of improvements to network infrastructure.[19]

The *2015 Open Internet Order* elaborated as follows:

> The key insight of the virtuous cycle is that broadband providers have both the incentive and the ability to act as gatekeepers standing between edge providers and consumers. As gatekeepers, they can block access altogether; they can target competitors, including competitors to their own video services; and they can extract unfair tolls. Such conduct would, as the Commission concluded in 2010, "reduce the rate of innovation at the edge and, in turn, the likely rate of improvements to network infrastructure." In other words, when a broadband provider acts as a gatekeeper, it

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[18]   *See, e.g., 2023 NPRM, supra* n. 7 at Section V.A.4.

[19]   *Preserving the Open Internet, Broadband Industry Practices,* REPORT AND ORDER, 25 FCC Rcd. 17905 (2010) at ¶ 14 (hereinafter *2010 Open Internet Order*).

   actually chokes consumer demand for the very broadband product
it can supply.[20]

The Commission claims this virtuous circle "drives innovation and investment on
the Internet."[21] If so, it is not obvious why broadband providers would seek to
disturb its operation. What part of virtue requires regulation? The Commission
provides no insight on why they would do so (or why they would reduce their
own demand, which is profit-reducing), but merely presumes they would.

   Figure 1 illustrates the nature of the virtuous circle. Investment (or innovation)
at the edge (I_e) drives demand for broadband (D_b), which increases broadband
provider profits (π_b) and their investment (I_b), which then increases the demand
(D_e), profits (π_e), and investment (I_e) at the edge. Round and round it goes. The
virtuous circle embeds an accelerator model of investment, where investment is
driven by profits.

Figure 1. The Virtuous Circle
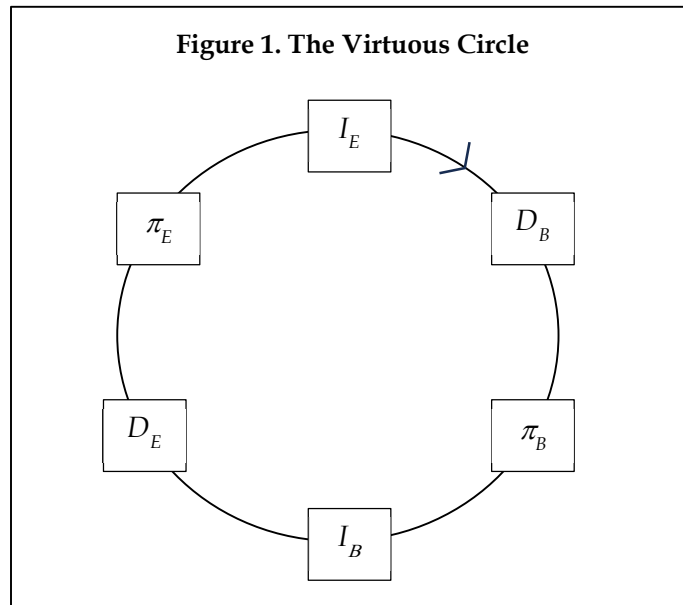
   The Commission's description of the virtuous circle provides several markers
for analyzing the incentives of broadband providers. First, the network core and
edge are viewed as strong complements. Second, the "gatekeeper" term suggests
monopoly power. Third, the unwinding of the virtuous circle occurs when

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[20] *2015 Order, supra* n. 4 at ¶ 20.

[21] *Id.* at ¶ 2.

broadband providers engage in activities that "choke" their own demand, such as blocking, choking, or levying unfair tolls (whatever "unfair" means) on traffic or edge providers.

To formalize, suppose that network core and edge services are strong complements in that for each unit of edge demand, consumers demand θ units of broadband service. Hence, if Q_b and Q_e denote the quantities demanded of broadband and edge products/services, then $Q_b = \theta Q_e$. Assume a simple linear edge service demand given by,

$$Q_e = E - (P_e + \theta P_b).\tag{1}$$

Let c_b and c_e denote the marginal costs of broadband and edge service production, respectively. Now, suppose that the broadband service provider is a monopoly (a "gatekeeper") and engages in no interference with the edge services. (Of course, broadband providers are not monopolies, but we embrace the Commission's assumption that they are). The edge market is competitive and therefore has marginal cost pricing such that $P_e = c_e$. The broadband gatekeeper would face the following profit maximization problem when determining the pricing of broadband service:

$$\max_{P_b}\left\{\left(P_b - c_b\right)\theta(E - c_e - \theta P_b\right\}.\tag{2}$$

The optimization yields the following first-order condition in the broadband price:

$$E - c_e - \theta P_b - \theta\left(P_b - c_b\right) = 0,\tag{3}$$

and solving for the profit maximizing broadband price,

$$P_b^* = \frac{1}{2}\left(\frac{E - c_e}{\theta} + c_b\right).\tag{4}$$

The maximized profit for the broadband firm would be,

$$\pi_b^* = \frac{(E - c_e - \theta c_b)^2}{4}.\tag{5}$$

This profit expression is clearly increasing in the demand for the edge products/services (E) and is decreasing the costs of the edge,

$$\frac{\partial \pi_b^*}{\partial E} > 0, \quad \frac{\partial \pi_b^*}{\partial c_e} < 0 \ . \tag{6}$$

Hence, the broadband monopoly has no profit incentive to diminish the value of edge services to the consumer nor to engage in any activity that would increase the costs of the competitive edge firms. Such actions would only diminish the profits of the broadband firm given the strong complementary nature of the edge.

Consider an alternative setup wherein the broadband gatekeeper can enter the edge market and leverage its control of broadband to monopolize the edge market. Assume (favorably) that the gatekeeper can produce edge services at the same marginal cost, c_e, as the existing competitive edge firms. The broadband/edge monopoly firm would solve the following pricing problem to maximize profits:

$$\max_{P_b, P_e} \left\{ (P_b - c_b)\theta(E - (P_e + \theta P_b)) + (P_e - c_e)(E - (P_e + \theta P_b)) \right\} \ , \tag{7}$$

which can be equivalently written as:

$$\max_{P_b, P_e} \left\{ [(P_e + \theta P_b) - (c_e + \theta c_b)][E - (P_e + \theta P_b)] \right\} . \tag{8}$$

The first-order conditions are identical in both prices and result in the single equation:

$$E + c_e + \theta c_b - 2(P_e^* + \theta P_b^*) = 0 \tag{9}$$

Solving for the linear combination of prices:

$$(P_e^* + \theta P_b^*) = \frac{E + c_e + \theta c_b}{2} \tag{10}$$

Inserting this result into the profit function implies the maximum achievable profit of the dual monopoly is:

$$\pi_M^* = \frac{(E - c_e - \theta c_b)^2}{4} \ . \tag{11}$$

This expression is identical to the profit the broadband gatekeeper achieved when the edge market was supplied by competitive firms ($\pi_M^* = \pi_b^*$). Hence, even using our unrealistic favorable cost assumption, the broadband monopoly does not benefit from leveraged monopolization of the edge market. If the broadband

monopoly cannot produce the edge/products with the same low cost (or quality) as the competitive edge firms, then the profits of the broadband monopoly would strictly decline if it monopolized a strongly complementary and competitive edge market.

As an alternative to an unprofitable leveraged monopolization of the edge market, one might consider the possibility of the broadband firm using its assumed network monopoly to extract a marginal fee, denoted by f from the edge firms. Given the competitive edge market, this fee results in an increase in the edge price to $P_e = c_e + f$. The broadband firm's profit maximization problem would become:

$$\max_{P_b, f}\left\{(P_b - c_b)\theta(E - c_e - f - \theta P_b) + f(E - c_e - f - \theta P_b)\right\}. \qquad (12)$$

The first-order condition for optimization of profit implies:

$$(f^* + \theta P_b^*) = \frac{E - c_e + \theta c_b}{2}. \qquad (13)$$

Putting this result into the profit function yields the maximized profit:

$$\pi_F^* = \frac{(E - c_e - \theta c_b)^2}{4}. \qquad (14)$$

Once again, we see that there is no increase in profit from the edge fee scheme versus the broadband firm only charging the optimal price for broadband service and leaving the edge market to the competitive edge firms ($\pi_F^* = \pi_b^*$). Any amount of revenue collected from a fee imposed on the edge firms would just reduce the demand for broadband service and result in a reduction in the price and revenue the broadband firm could collect from consumers.

Within a virtuous circle, *as depicted by the Commission*, there is no incentive for broadband providers to interfere with the edge services to increase profits.[22]

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[22]   In theoretical model less directly tied to the virtuous circle, the theoretical predictions on investment are mixed. *See*, *e.g.*, J.P. Choi and B. Kim, *Net Neutrality and Investment Incentives*, 41 RAND JOURNAL OF ECONOMICS 446-471 (2010); P. Njoroge, A. Ozdaglar, N.E. Stier-Moses, and G.Y. Weintraub, *Investment in Two-Sided Markets and the Net Neutrality Debate*, 12 REVIEW OF NETWORK ECONOMICS 12 (2014); J.S. Gans and M.L. Katz, *Net Neutrality, Pricing Instruments and Incentives*, NBER

(Footnote Continued. . . .)

Profits are not increased by blocking, choking, requiring paid prioritization based on content, or monopolizing edge services (even under favorable assumptions). Thus, prohibitions on such actions appear not to be a source of diminished investment incentives. Rather, it is the risk that Title II regulation may be used in other ways, or in ways that do not target the normal scope of "neutrality." Broad "catch all" provisions, such as the General Conduct Rule adopted in the *2015 Open Internet Order* and again proposed in the *2023 NPRM*, are certain to cause concern.[23] Likewise, the *2023 NPRM* proposes to tack on additional regulations from Title II—such as the potential for entry/exit hurdles and build-out mandates under Section 214 and far-reaching regulations in the name of addressing putative national security, cyber security, public safety, network resiliency, and several other newfound objectives—so worries regarding the slippery slope are confirmed. And, while the Democratic commissioners say they do not intend to use Title II to impose rate regulation, this "pinky promise" cannot be trusted as the Commission ignores a basic fact: *Net Neutrality by Title II is explicitly rate regulation* (the no blocking and no paid prioritization rules)—a fact explicitly recognized by the D.C. Circuit in *Verizon v. FCC*.[24] Accordingly, the effects of Title II regulation on investment may have little to do with Net Neutrality *per se* and everything to do with the fear of the aggressive regulation of broadband services on several fronts that have little to do with Net Neutrality.[25]

III. Commission Arguments on Investment Effects

A significant component of the debate over Title II regulation is its effect on investment incentives, with Republican administrations arguing it reduces investment and Democratic administrations arguing it does not. Yet, the

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Working Paper 22040 (February 2016). The U.S. Department of Justice warned: "Marketplace restrictions proposed by some proponents of 'net neutrality' could in fact prevent, rather than promote, optimal investment and innovation in the Internet, with significant negative effects for the economy and consumers." *DOJ Cautions Against Premature Internet Regulation*, GOVERNMENT TECHNOLOGY (July 27, 2010) (available at: https://www.govtech.com/archive/doj-cautions-against-premature-internet-regulation.html).

[23]   *2015 Order, supra* n. 4 at Section II.C.2; *2023 NPRM, supra* n. 7 at Section V.B.4.

[24]   *Verizon v. FCC*, 740 F.3d 623, 658 (D.C. Cir. 2014); *see also* G.S. Ford and L.J. Spiwak, *Tariffing Internet Termination: Pricing Implications of Classifying Broadband as a Title II Telecommunications Service,* 67 FEDERAL COMMUNICATIONS LAW JOURNAL 1 (2015) (available at: http://www.fclj.org/wp-content/uploads/2015/02/Tariffing-Internet-Termination.pdf).

[25]   *See* L.J. Spiwak, *USTelecom and its Aftermath,* 71 FEDERAL COMMUNICATIONS LAW JOURNAL 39 (2019) (available at: http://www.fclj.org/wp-content/uploads/2018/12/71.1-%E2%80%93-Lawrence-J.-Spiwak.pdf).

Democratic administrations' argument is internally inconsistent. On the one hand, they have argued (incorrectly) that within a virtuous circle broadband providers have a profit incentive to engage in blocking, throttling, paid prioritization, and reducing competition on the edge. On the other hand, they argue that the Title II rules on broadband providers will have no negative effect on investment incentives. Those dual claims cannot be true: if broadband providers have a profit motive to engage in non-neutral conduct, as the Commission has asserted, then prohibiting them from doing so will depress profits and investment.[26] Former FCC Chairman Tom Wheeler (who first codified Title II regulation of all broadband services) admitted as much when he observed the need "to balance the goals of openness with the needs of network operators to receive a return on their investment," but then claimed there would be no effect on investment.[27] You cannot have it both ways. *By the Commission's own "virtuous cycle" hypothesis, which embraces an accelerator model of investment, Net Neutrality by Title II regulation must reduce profits and investment.*[28] Such faulty logic is no surprise as economics appears to play no role in the application of Title II regulation of broadband services, which was established by a former FCC chief economist (in 2015) who described the Commission's crafting of the *2015 Open Internet Order* as an "economics-free zone" where "a fair amount of the economics was wrong, unsupported, or irrelevant."[29]

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[26]   The Commission's Net Neutrality orders make this plain: (1) "if broadband providers can profitably charge edge providers for prioritized access to end users, they will have an incentive to degrade or decline to increase the quality of the service they provide to non-prioritized traffic" (*2010 Order, supra* n. 19 at ¶ 29); (2) "The possibility of enhancing profit margins can be expected to induce broadband providers to make the appropriate network investments needed to capture a reduction in costs made possible only through technological advances." (*2015 Order, supra* n. 4 at ¶ 412).

[27]   *Remarks of FCC Chairman Tom Wheeler*, Silicon Flatirons Center, Boulder Colorado (February 9, 2015) (available at: https://apps.fcc.gov/edocs_public/attachmatch/DOC-331943A1.pdf).

[28]   *2010 Open Internet Order, supra* n. 19 at ¶ 14 ("a virtuous circle of innovation in which new uses of the network—including new content, applications, services, and devices—lead to increased end-user demand for broadband, which drives network improvements, which in turn lead to further innovative network uses. [] These network improvements generate new opportunities for edge providers, spurring them to innovate further. Each round of innovation increases the value of the Internet for broadband providers, edge providers, online businesses, and consumers.").

[29]   T. Brennan, *Is the Open Internet Order an "Economics Free Zone"*, FREE STATE FOUNDATION BLOG (June 28, 2016) (available at: https://freestatefoundation.org//wp-content/uploads/2019/06/Is-the-Open-Internet-Order-an-%E2%80%9CEconomics-Free-Zone%E2%80%9D-062816.pdf).

In its *2023 NPRM*, the Commission claims that the investment effects of its Title II approach "were unsubstantiated."[30]   Yet, several published and unpublished studies presented evidence of the deleterious investment effects of Net Neutrality and common carrier regulations, both at home and abroad, and there is no evidence to the contrary.[31]   It is unclear what evidence suffices to overcome the bias for intervention.   In fact, there would have been no dispute about the negative investment effects of Title II save the alarming promotion by Title II advocates—not only before the Commission but also when challenging the *RIFO* before the D.C. Circuit in *Mozilla*—of a discredited study that used corrupted and made-up data to find "no effect" on investment.[32]   Another effort to support the "no effect" hypothesis, also pushed by Title II advocates, was all but retracted

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[30]   *2023 NPRM*, *supra* n. 7 at ¶ 57.

[31]   G.S. Ford, *Net Neutrality and Investment in the US: A Review of Evidence from the 2018 Restoring Internet Freedom Order*, *supra* n. 11; G.S. Ford, *Regulation and Investment in the U.S. Telecommunications Industry, supra* n. 11; W. Briglauer, C. Cambini, K. Gugler, and V. Stocker, *Net Neutrality and High-Speed Broadband Networks: Evidence from OECD Countries*, 55 EUROPEAN JOURNAL OF LAW AND ECONOMICS 533–571 (2023).   *See also*, G. S. Ford, *Does Title II Reduce Infrastructure Investment? Repairing Hooton's Analysis*, PHOENIX CENTER POLICY PERSPECTIVE No. 19-06 (October 15, 2019) (available at: https://www.phoenix-center.org/perspectives/Perspective19-06Final.pdf);   G.S.   Ford, *Infrastructure Investment After Title II*, PHOENIX CENTER POLICY PERSPECTIVE No. 18-09 (November 1, 2018) (available at: https://www.phoenix-center.org/perspectives/Perspective18-09Final.pdf); G.S. Ford, *Comcast's Capital Spending After Reclassification: A Check on Claims*, PHOENIX CENTER POLICY PERSPECTIVE   No.   18-03   (April   25,   2018)   (available   at: https://www.phoenix-center.org/perspectives/Perspective18-03Final.pdf); G.S. Ford, *Reclassification and Investment: A Statistical Look at the 2016 Data*, PHOENIX CENTER POLICY PERSPECTIVE No. 17-08 (July 13, 2017) (available at: https://www.phoenix-center.org/perspectives/Perspective17-08Final.pdf); G.S. Ford, *Broadband Speeds Post-Reclassification: An Empirical Approach*, PHOENIX CENTER POLICY PERSPECTIVE No. 17-07 (June 27, 2017) (available at: https://www.phoenix-center.org/perspectives/Perspective17-07Final.pdf); G.S. Ford, *Net Neutrality, Reclassification and Investment: A Further Analysis*, PHOENIX CENTER POLICY PERSPECTIVE No. 17-03 (May 16, 2017) (available at: https://www.phoenix-center.org/perspectives/Perspective17-03Final.pdf); G.S. Ford, *Net Neutrality, Reclassification and Investment: A Counterfactual Analysis*, PHOENIX CENTER POLICY PERSPECTIVE No. 17-02 (April 25, 2017) (available at: https://www.phoenix-center.org/perspectives/Perspective17-02Final.pdf).

[32]   *Net Neutrality and Investment in the US, id*; G.S. Ford, *A Review of the Internet Association's Empirical Study on Network Neutrality and Investment*, PHOENIX CENTER POLICY PERSPECTIVE No. 17-09 (July   24,   2017)   (available   at: https://www.phoenix-center.org/perspectives/Perspective17-09Final.pdf) ("Dr. Hooton has simply made his data up. In fact, these projections, possibly from multiple sources, account for 70% of his investment data during the treatment period (7 of 10 years)."); G.S. Ford, *A Further Review of the Internet Association's Empirical Study on Network Neutrality and Investment*, PHOENIX CENTER POLICY PERSPECTIVE No. 17-10 (August 14, 2017) (available at: https://www.phoenix-center.org/perspectives/Perspective17-10Final.pdf) ("Dr. Hooton's analysis of USTelecom's data on U.S. broadband investment for years 1996 through 2015 employs data that have been corrupted in some way. Dr. Hooton's results are not consistent with the actual USTelecom data, a fact easily demonstrated").

from the publishing journal, whose editor described the paper as offering only "spurious results."[33]   A published Comment on the paper (in the same journal) revealed the measure of investment used in that study did not measure investment at all.[34]   Moreover, the "no investment effect" argument from pro-Net Neutrality advocates is perplexing.   Section 706 of the Communications Act directs the Commission to encourage infrastructure investment, not normalize it, and the Commission claims via its virtuous cycle hypothesis that Title II regulation will "drive[] investment on the Internet" and "further [] deployment," even though any logical interpretation of the virtuous circle says otherwise.[35]

The Commission's conjecture that since network infrastructure investments are "long-term, irreversible investments" such investments are unlikely to change "shortly following the adoption" of an aggressive regulatory agenda is unfounded.[36]   Indeed, network infrastructure investments are long-lived, but being so does not impede adjustments to capital spending at the margins; investment could be cut by a few percentage points with relative ease as firms shave spending on marginal capital projects.   For instance, telecommunications investment fell 10.4% in 2009 at the onset of a recession, demonstrating that capital spending can change in short order.   Moreover, the Commission's "Digital Strategy" states its vision is "to promote innovation, investment, competition and consumer empowerment for the communications platforms of today and the future," so the Commission believes its actions can affect investment.[37] In any case, the effect of the Commission's actions on investment is an empirical question, not

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[33]   E. Bohlin, *Expression of Concern: Testing the Economics of the Net Neutrality Debate*, 44 TELECOMMUNICATIONS POLICY 101869 (2020) (available at: https://www.sciencedirect.com/science/article/pii/S0308596120300975). The paper's author was offered a change to provide corrections but was unable to provide a response.

[34]   G.S. Ford, *Testing the Economics of the Net Neutrality Debate: A Comment*, 45 TELECOMMUNICATIONS POLICY 102137 (2021) (available at: https://www.sciencedirect.com/science/article/abs/pii/S0308596121000422).

[35]   *2015 Order, supra* n. 4 at ¶¶ 2, 55.

[36]   *2023 NPRM, supra* n. 7 at ¶ 57.

[37]   *The Federal Communications Commission Digital Strategy*, Federal Communications Commission (last visited November 23, 2023) (available at: https://www.fcc.gov/general/federal-communications-commission-digital-strategy#:~:text=The%20FCC's%20vision%20is%20to,broad%20opportunity%20for%20all%20Americans).

merely a matter of conjecture by regulators or economic theory. I now turn to that empirical question.

IV. Data

In order to ensure the investment data measures the type of investments that may be affected by the Commission's policies, investment in broadband infrastructure is measured using data from USTelecom for years 2003-2020.[38] These data are the most commonly cited measure of broadband investment, are used in several empirical studies of telecommunications investment, and are cited by both Republican and Democratic administrations at the Commission.[39] Data prior to 2003 are excluded (1996-2002) given the investment bubble that followed the 1996 Act, which substantially affected investment in a manner unique to the telecommunications industry (a distinct treatment).[40] Years after 2020 are

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[38] *2022 Broadband Capex Report*, USTelecom (September 2023) (available at: https://ustelecom.org/wp-content/uploads/2023/09/2022-Broadband-Capex-Report-final.pdf) ("This USTelecom survey collects capital expenditures data for major wireline, wireless and cable broadband providers to approximate an industry aggregate. This figure does not include smaller wireline broadband providers, electric cooperatives or satellite broadband providers due to the difficulty of obtaining consistent and comparable data. We estimate these competitors' capex contributions at no less than $2 billion. Thus, the $102.4 billion figure we report today is a conservative estimate."). This measure of investment is not the same as in *Regulation and Investment in the U.S. Telecommunications Industry, supra* n. 11, which was from the BEA data and included investment in equipment, intellectual property, and buildings. Consequently, the estimated effects between the two studies need not be the same. Also, the USTelecom data excluded broadcasting investment and perhaps investment by non-broadband providers among other differences.

[39] *See*, *e.g.*, C. Hooton, *An Empirical Investigation of the Impacts of Net Neutrality*, Internet Association (2017)("2010 treatment date is a more accurate implementation year") (available at: https://regmedia.co.uk/2017/07/17/internet-association-net-neut-economics.pdf); K.A. Hassett and R.J. Shapiro, *The Impact of Title II Regulation of Internet Providers On Their Capital Investments*, Sonecon (November 2014) (available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2540563); Wheeler 2016 BB Report https://docs.fcc.gov/public/attachments/FCC-16-6A1.pdf); 2016 *Broadband Progress Report*, Federal Communications Commission (Rel. January 29, 2016); *Responses to Written Questions Submitted by Chairman Roger F. Wicker to Honorable Jessica Rosenworcel*, Senate Commerce Committee (available at: https://www.commerce.senate.gov/services/files/29252C37-CCD1-43B7-90E6-060579D8BA52); *Seventeenth Section 706 Report Notice of Inquiry*, GN Docket No. 22-270 (Rel. November 1, 2023) (available at: https://docs.fcc.gov/public/attachments/FCC-23-89A1.pdf); *2022 Communications Marketplace Report*, Federal Communications Commission, GN Docket No. 22-203 (Rel. December 30, 2022) (available at: https://docs.fcc.gov/public/attachments/FCC-22-103A1.pdf); *2020 Broadband Deployment Report*, Federal Communications Commission, GN Docket No. 19-285 (rel. April 24, 2020) (available at: https://docs.fcc.gov/public/attachments/FCC-20-50A1.pdf).

[40] A similar approach was used in prior work. *Reclassification and Investment: A Statistical Look at the 2016 Data, supra* n. 31; *Infrastructure Investment After Title II, supra* n. 31.

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excluded because of the onset of the Covid Pandemic in early 2020 that differentially affected investment among industries in subsequent years and also the introduction of billions in subsidies dollars from the Rural Digital Opportunities Fund ("RDOF") and other state and federal programs that accelerated around that time (affecting capital investments by broadband providers).[41] The sizable subsidies that are now being injected into the industry by federal and state governments will make quantifying investment effects of policies difficult in future periods. As in Ford (2018) and Hooton (2017), the treatment period follows the proposed application of Title II regulation in 2010 when the stock market incorporated reclassification into stock prices.[42] There are eight years (2003-2010) in the pre-treatment period and ten years (2011-2020) in the treatment period.

A counterfactual for telecommunications investment is constructed by selecting a control group of other U.S. industries. Such investment is reported in the fixed-asset tables of the Bureau of Economic Analysis ("BEA").[43] A few sectors are excluded from the control pool including sectors within the Information

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[41]   Auction 904 was held in 2020 (https://www.fcc.gov/auction/904). Prior subsidy auctions were relatively paltry in comparison. For instance, the Connect America Fund Phase II auction (Auction 903), held in 2018, provided only $1.49 billion over 10 years. CNN EDITORIAL RESEARCH, *Covid-19 Pandemic Timeline Fast Facts*, CNN (May 8, 2023) (available at: https://www.cnn.com/2021/08/09/health/covid-19-pandemic-timeline-fast-facts/index.html). Subsidies for investment are typically complemented by investments from providers, in some cases mandatorily so. In any case, the estimated investment effects are largely unaffected by extending the data through 2022, except for that such effects are summed over twelve rather than ten years.

[42]   *Net Neutrality and Investment in the US, supra* n. 11; C. Hooton, *An Empirical Investigation of the Impacts of Net Neutrality*, Internet Association (2017) ("2010 treatment date is a more accurate implementation year") (available at: https://regmedia.co.uk/2017/07/17/internet-association-net-neut-economics.pdf).

[43]   The Private fixed assets (the sum of all industries), Broadcasting and Telecommunications, and Information sectors (which includes the Broadcasting and Telecommunications) are excluded. Data available at: https://www.bea.gov/itable/fixed-assets. Investment is obtained from the Investment in Private Fixed Assets by Industry (Table 3.7E). *NIPA Handbook: Concepts and Methods of the U.S. National Income and Product Accounts,* Bureau of Economic Analysis (December 2022), at Ch.   4,   6   *(available   at:*   https://www.bea.gov/resources/methodologies/nipa-handbook/pdf/chapter-04.pdf). Naturally, one might think of using data from other countries to serve as a counterfactual. However, nations are not subject to the same regulations over time, some providers are nationally owned, and most nations have implemented Net Neutrality of some sort. *See*, *e.g.*, Briglauer, *et al.*, *supra* n. 31 (30 of 32 OECD nations had Net Neutrality regulation of some sort over the treatment period used here). Trying to account for the differences in investment behaviors across many countries would require a rich model informed by industry expertise across many nations.

industry, the Federal Reserve, and the Education sector that is largely funded by the government and has experienced pronounced disinvestment in the recent decade.[44] Based on the similarity of investment trends prior to 2011, a control group is selected to include 20 members so that clustered standard errors may be used.[45] Net capital stock is also from the BEA data is used as a regressor.[46]

V. Empirical Approach

The Difference-in-Differences estimator ("DD") is used to estimate a plausibly causal effect.[47] The DD estimator is defined as:

$$\delta = (Y_1^T - Y_0^T) - (Y_1^C - Y_0^C) \, , \tag{15}$$

where Y is the average outcome for the treated group T and the control group C in Period 0 and 1. The δ is simply the difference in outcomes between the two groups in the two periods 1 and 0 (the difference in differences). If the two groups are otherwise comparable and the Y across groups follows the same path over time (the common trends assumption), then δ is a plausible estimate of the causal effect of the treatment. The DD estimator is estimated by the regression,

$$Y_{it} = \delta D_t B + \alpha K_{it-1} + \lambda_i + \mu_t + \varepsilon_{it} \, . \tag{16}$$

where the dependent variable is the natural log of investment by sector i in time t, D_t is an indicator for the treatment period (1 after 2010), B is an indicator for the telecommunications sector (the treated sector), $K_{it\text{-}1}$ is the lagged net capital stock of the industry, λ_i is an industry fixed effect, μ_t is a time fixed effect, and ε_{it} is the econometric disturbance term. This model is the traditional two-way fixed effects regression. Equation (16) is estimated by least squares and hypothesis tests are

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[44]   M. Leachman, K. Masterson and E. Figueroa, *A Punishing Decade for School Funding*, Center on   Budget   and   Policy   Priorities,   (November   29,   2017)   (available   at: https://www.cbpp.org/research/a-punishing-decade-for-school-funding).

[45]   This selection of controls based on the Root Mean Squared Error between each sector's investment and telecommunications investment. While there is some debate about how many clusters is adequate for clustered errors, Rogers (1993) concludes that 20 is adequate (each cluster is no more than 5% of the sample). W. Rogers, *Regression Standard Errors in Clustered Samples*, 3 STATA TECHNICAL BULLETIN 19-23 (1994).

[46]   Capital stock data is obtained from the Investment in Private Fixed Assets by Industry (Table 3.1E).

[47]   J.D. Angrist and J. Pischke, MOSTLY HARMLESS ECONOMETRICS (2009) at Ch. 5.

performed on δ using Driscoll-Kraay standard errors.[48]   Hypothesis tests are likewise evaluated using Randomized Inference given the single treatment group, which complicates hypothesis testing with a potential downward bias in the standard errors, though this does not affect the estimated coefficients.   Also, sensitivity to the control group is analyzed using a jackknife procedure, where one member of the control group is dropped and the δ coefficient is re-estimated (providing a range of δ coefficients).

VI. Results

Before turning to the regression results, some descriptive and graphical analysis can shed light on expectations. In real dollars (base year 2020), average telecommunications investment was $81.3 billion in the pre-treatment and $81.6 billion in the treatment period, nearly unchanged with an increase of 0.43%.[49] In contrast, average investment across all industries in the data rose 14.1% between the two periods, and for the control group investment rose 13.9% between the two periods.

Figure 2 illustrates the investment trends for telecommunications and the control group (unconditioned on lagged capital stock) and their difference (the shaded area).[50] The parallel trends assumption seems reasonable given the similar patterns in investment during the pre-treatment period.   Thus, looking at telecommunications investment alone—ignoring a counterfactual as is common— presents a misleading view of the effects of the regulation. The question is not how telecommunications investment compares to the prior year (investment changes every year); it is how investment compares to what investment would have been absent the regulation, which is measured by a counterfactual. The "specter of Title II regulation" hypothesis is largely supported as the difference between actual investment and the counterfactual is fairly consistent in the treatment period. With the dark cloud of Title II regulation hanging over the industry during both the regulatory and deregulatory episodes, the restoration of robust investment incentives in the telecommunications industry seems to require

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[48]   Tests indicate the presence of correlation between the groups. J. Driscoll and A. C. Kraay, *Consistent Covariance Matrix Estimation with Spatially Dependent Data*, 80 REVIEW OF ECONOMICS AND STATISTICS 549–560 (1998).

[49]   The data is converted into 2020 dollars using the GDP Deflator.

[50]   For illustration purposes, the series are centered on year 2010 and industry fixed effects have been removed.

Congressional or judicial action to preclude application of Title II regulation on broadband services.

Figure 2. Investment Trends
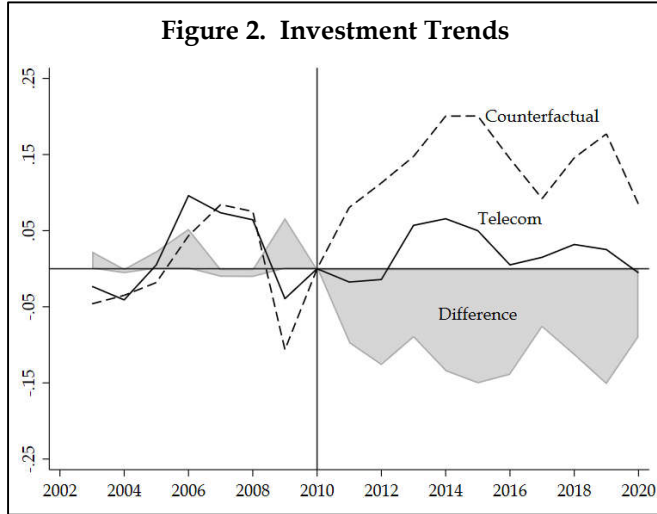
Regression results are summarized in Table 1. Two models are presented: the first unconditional on lagged capital stock and the second including the regressor. Both regressions are statistically significant at the 1% level. Note that in all models the dependent variable has a statistically insignificant slope difference in the pre-period, which supports parallel trends, and that the false treatment in years 2009-2010 (excluding later years) likewise has a statistically insignificant coefficient, supporting parallel trends and excluding anticipation.

Table 1. Regression Results		
	Model (1)	Model (2)
	Coefficient (DK t-stat)	Coefficient (DK t-stat)
δ	-0.135*** (-19.69)	-0.105*** (-5.18)
α	…	0.353*** (4.13)
Effect Size	-0.126	-0.100
Range	-0.139, -0.106	-0.113, -0.082
Observations	378	378
F-Stat	388***	20.7***
Stat. Sig. *** 1% ** 5% * 10%.		

Turning to the δ coefficients, the unconditional coefficient is -0.135 and when conditioned on lagged capital stock is -0.105, both of which are statistically

significant at the 1% level, though the standard errors used to calculate these t-statistics may be too small given the single treatment unit. However, by Randomized Inference, the t-statistic on δ for the telecommunications industry is the most negative of the twenty-one possible. The effect sizes are -0.126 and -0.10, the latter implying telecommunications investment is approximately 10% below expectations.[51] From the jackknife procedure, the range of effect sizes in Model (2) is -11.3% to -8.2%. While these results suggest telecommunications investment is well below expectations, the effect size is consistent with a reduction in investment at the margins. The estimates from Model (2) suggest that prospects of Title II policy—first proposed in 2010 and continuing to this day—reduced investment by approximately 10% between 2011 and 2020, and this figure will be used in further analysis.[52] Figure 2 suggests that effect was nearly immediate and stable over the treatment period.

Given the difficulty of hypothesis testing with a single treated unit, Figure 3 illustrates another way to view the data. A variable is constructed by subtracting the (natural log of) investment for the controls from telecommunications investment, which is centered for each control in the pre-treatment period. A kernel-weighted local polynomial regression is then fitted to this variable. This regression is unconditioned on the lagged capital stock so is akin to Model (1) and is a smoothed version of the difference illustrated in Figure 2.[53] Note that this smoothing approach will cause the difference variable to cross the boundary of the treatment date.

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[51]   With the dependent variable in natural log form, the effect size is exp(δ) – 1.

[52]   Including 2021 and 2022 the δ coefficients are -0.130 and -0.101. Of course, total investment lost will be larger since two additional years are included. Also, using the BEA data for Broadcasting and Telecommunications investment (Tables 3.7ESI and 3.1ESI to measure all investment), the δ coefficients are -0.106 and -0.109 for the two models (both statistically significant at the 1% level). However, the pseudo-treatment is relatively large and statistically different from zero. Investments in the two series are quite different in several years, especially near the end of the series where the BEA data is quite volatile.

[53]   In fact, a least squares regression of this variable on the treatment dummy provides the same δ coefficient as Model (1).

Figure 3. Trends in Investment Difference
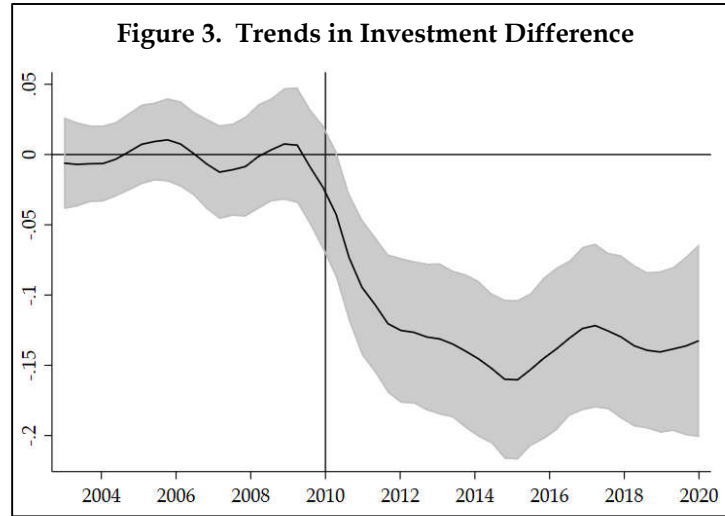
As illustrated in the figure, the dependent variable is effectively zero in the pre-treatment period and has no slope, which is consistent with the parallel-trends hypothesis. For those eight years, the patterns in investment between the controls and the telecommunications industry are the same (which is also illustrated in Figure 2). During the treatment period, however, the difference in investment falls sharply, and zero is well outside the 95% confidence interval. While not determinative, relative to what seems to be a suitable control group, telecommunications investment appears to be lagging expectations, and this shortfall is coincident with the treatment date. A test for the year in which the linear slope of this variable changes is, in fact, the first treatment year (2011).[54]

A. *Lost Investment and Macroeconomic Effects*

Lost investment from the back-and-forth squabble over Title II classification may be estimated by using the effect size and total investment in the treatment period. Total investment (in real dollars) during the ten-year treatment period is $815.8 billion but the counterfactual investment levels from Model (1) is $897.3 billion, thus Title II regulation (and its ongoing prospects) has resulted in a lost investment of $81.5 billion over the ten years (2011-2020), or $8.1 billion annually. This shortfall in investment is nearly twice the subsidy dollars allocated to broadband deployment by the IIJA ($42.5 billion). The jackknife procedure

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[54]   R.S. Pindyck and D.L. Rubenfeld, ECONOMETRIC MODELS & ECONOMIC FORECASTS (1991) at pp. 119-120.

provides a range of lost investment of $66.9 to $92.2 billion over the treatment period.

The movement toward more burdensome regulation of the telecommunications industry has implications for the broader economy. Beard, Ford and Kim (2014) estimate that each million dollars of investment in the information sector affects 10 within-sector jobs and 24 jobs throughout the economy.[55] Based on the results from Model (2), the lost investment of $8.1 billion annually creates an annual job loss of 81,494 information sector jobs (about 2.9% of total sector employment) and 195,585 jobs across the economy. Average compensation in the information sector in 2022 was about two-thirds larger than the national average (for private industries), so these job reductions (in total) represent a sizable effect on wages in the economy—about a $18.5 billion loss in annual wages annually, or $185 billion over the ten-years.[56]

These job loss estimates may be compared to the results in Ford (2017) where a DD approach is used to estimate the employment changes in the telecommunications sector from Title II regulation (2010-2016).[57] Job losses estimated in that study range from 93,000 to 117,000 telecommunications sector jobs, or about 10-13% of telecommunications sector employment. The counts of job losses are very similar between these two approaches, though in Ford (2017) the analysis is restricted to the telecommunications industry.[58] The coincidence of investment and employment losses, as well as a slowdown in the growth of broadband speeds documented in Ford (2017), provides supporting evidence for the investment effects of Title II regulation.[59]

Several empirical studies estimate the effect of telecommunications infrastructure on Gross Domestic Product ("GDP"), with most finding a large

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[55] T.R. Beard, G.S. Ford and H. Kim, *Capital Investment and Employment in the Information Sector*, 38 TELECOMMUNICATIONS POLICY 317-382 (2014).

[56] Compensation data from the BEA tables and 6.2D and 6.5D (available at: https://www.bea.gov/data/employment/employment-by-industry). Non-information sector jobs are rated at the national average for all industries.

[57] Ford, "*Regulatory Revival" and Employment in Telecommunications*, *supra* n. 3.

[58] Telecommunications employment is about 30% of the Information sector in the 2010-2016 period, so the 11% reduction in telecommunications employment in Ford (2017) suggests a 3.3% decline in Information sector employment from the telecommunications sector alone.

[59] *Broadband Speeds Post-Reclassification: An Empirical Approach*, *supra* n. 31.

effect of telecommunications infrastructure on GDP.[60] Using an empirical model common to prior research, an 11% shortfall in annual telecommunications equipment investment is estimated to reduce (real) GDP by about $145 billion annually (about 0.7% annually), or $1.45 trillion over ten years.[61] These are sizable losses in economic activity.

B. *Making Matters Worse*

While these effect sizes are large yet plausible, they likely understate the effects of the form of Title II regulation recently proposed by the Commission. The Biden Administration's proposed Title II reclassification regime is more intrusive than the one the FCC adopted in the *2015 Open Internet Order* in that, among other additions, it incorporates compliance with Section 214 of the Communications Act into the regulatory paradigm.[62] Under Section 214,

> No carrier shall undertake the construction of a new line or of an extension of any line, or shall acquire or operate any line, or extension thereof, or shall engage in transmission over or by means of such additional or extended line, unless and until there shall first have been obtained from the Commission a certificate that the present or future public convenience and necessity require or will

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[60] *See*, *e.g.*, *Impact of Broadband on the Economy: Research to Date and Policy Issues*, International Telecommunications Union (April 2012), (available at: https://www.itu.int/ITU-D/treg/broadband/ITU-BB-Reports_Impact-of-Broadband-on-the-Economy.pdf); M. Minges, *Exploring the Relationship between Broadband and Economic Growth*, WORLD BANK BACKGROUND PAPER 102955 (January 2015).

[61] The estimate is comparable to prior studies on the effect of broadband investment on economic growth, though most prior studies use service adoption as a proxy for investment. The effect on GDP is constructed by estimating a production function where real GDP is a function of real gross capital formation, the number of non-farm employees, the import-export share of GDP, and real telecommunications equipment investment over the years 1979 through 2020. All variables (except for trade share) are expressed in natural log form. The model is estimated by Fully-Modified Ordinary Least Squares ("FMOLS") to address cointegration and embeds a switching model to account for the 1996-2002 investment bubble following the 1996 Act. P.C.B. Phillips and B.E. Hansen, *Statistical Inference in Instrumental Variables Regression with I(1) Processes*, 57 REVIEW OF ECONOMICS STUDIES 57: 99–125 (1990). All the coefficients are statistically significant at the 1% level or better. The coefficient on telecommunications investment is 0.077. Lost telecommunications investment is assumed to be 10.5%, which is the average of the two models.   The BEA data provides telecommunications equipment investment and other variables are from the Federal Reserve Bank. Data available at https://fred.stlouisfed.org.

[62] *2023 NPRM, supra* n. 7 at ¶ 108.

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require the construction, or operation, or construction and operation, of such additional or extended line….[63]

Section 214 is a "Mother, may I" investment process, which will discourage or slow investment more so than shown by empirical research for the prior Title II regime (which excluded Section 214) and certainly more so than Title I regulation.

The Commission's rationale for not forbearing from Section 214 is that Section 214 provides the Agency with a mechanism to protect our nation's national security via the ability to review and potentially revoke authorizations to provide service.[64] The application of Section 214 imposes risk on ISPs seeking exit from unprofitable markets or services—including potential delays or disapprovals. Further, the FCC has signaled that it needs to reclassify in order to impose an additional and potentially highly burdensome layer of national security review. But the FCC does not consider how its decision not to forbear from Section 214 will negatively affect smaller ISPs.

Under Section 214, any transfer of control must be reviewed and approved by the Commission, a process that can take months or longer. This process can also include national security review by the Executive Branch coordinated by the Department of Justice (a group known as "Team Telecom").[65] Smaller providers rarely deal with this kind of extensive review and timeframes to close even the simplest transactions. This increase in compliance costs will make it significantly harder for them to attract investment capital, because investors will just direct investment to larger, less risky companies—or other industries entirely—rather than place their capital in regulatory limbo. Absent significant hiring across the Commission and several other agencies, the above timeframes will inevitably get longer as the volume of applications increases. Applying Section 214 will particularly hobble smaller ISPs at exactly the wrong time and make the government less responsive at exactly the wrong time.

Finally, this explicit inclusion of additional portions of Title II regulation confirms fears of the "slippery slope phenomenon," especially given the far-reaching new purposes cited by the *2023 NPRM* as motives for Title II regulations, such as national security and cybersecurity, which had never been part of the debate or scope of potential Commission regulations until now. As exhibited by

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[63]   47 U.S.C. § 214.

[64]   *See 2023 NPRM, supra* n. 7 at ¶ 27.

[65]   https://www.justice.gov/nsd/team-telecom.

the current Commission, regulators are comfortable adding more Title II regulations to suit political priorities. Adding to this the Commission's intent to review the locations of capital spending within its Digital Discrimination rules, private investment incentives are sure to be curtailed more so than in the past from regulatory excess.[66]

VII.   Conclusions

The effect of regulation on investment plays a key role in the debate over Net Neutrality regulation via Title II of the Communications Act. Studies on investment in the U.S. and the OECD reveal such regulations reduce infrastructure investment, and no credible study—published or otherwise—has shown anything different. In this POLICY PAPER, the question of Title II regulation and investment in the U.S. is revisited.

Using investment by broadband providers reported by USTelecom and investment data from the Bureau of Economic Analysis, a difference-in-differences model reveals, once more, that investment in the telecommunications sector is below expectations. Investment in the sector is below expectations by approximately 10%, with a total loss of investment over a ten-year period of about $81.5 billion, with an estimated range of about $67 to $92 billion. This reduction in investment is estimated to reduce employment in the information sector by approximately 81,500 jobs and total employment by 195,600 jobs (and $18.5 billion in lost labor compensation annually, or $185 billion over ten years), a finding consistent with empirical evidence on telecommunications employment over the same period. Losses in GDP from reduced investment amount to about $145 billion annually, or $1.45 trillion over ten years.

All the evidence, including the results presented here, points to investment losses in the telecommunications sector, and outcomes related to that investment, such as employment and network upgrades, follow the introduction of Title II regulation for broadband services. The "Mother, may I" investment requirements of adding Section 214 and other bases for imposing prescriptive regulations—such as national security, cybersecurity, resiliency, public safety, and privacy—to the Title II approach seems certain to make matters worse if the Commission proceeds as planned. While current FCC leadership claims the investment effects of its

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[66]   *Section 60506 Order, supra* n. 7; Ford and Spiwak, *Digital Discrimination Under Disparate Impact, supra* n. 4.

approach to broadband regulation are "unsubstantiated," this assertion has no empirical support and is contradicted by the evidence.