The Impact of Government-Owned Broadband Networks on Private Investment and Consumer Welfare

SGLF

STATE GOVERNMENT
LEADERSHIP FOUNDATION

WRITTEN BY

Dr. George S. Ford

ABOUT THE STATE GOVERNMENT LEADERSHIP FOUNDATION:

Since its founding over a decade ago, The State Government Leadership Foundation (SGLF) has served as the premier national conservative policy organization equipped to engage state leaders at all levels of state government. SGLF has worked proactively to promote sound policy throughout the states, educate the public and state government officials, and defend key policy ideas, state leaders and legislation when they come under attack.

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For over a decade, the State Government Leadership Foundation (SGLF) has assisted state elected leaders around the country in crafting sound policy solutions and promoting their successes. Today, I am proud to release a comprehensive study authored by Dr. George Ford about the economics of municipal broadband that illustrates the commitment SGLF has to conservative leaders and innovative policy solutions. The report is timely because all over the country, state laws that oversee and constrain government ownership of broadband networks are under threat. Such laws are important due to the adverse impacts of government-owned broadband networks on consumer tax bills, competition among private broadband providers and the flow of private investment into digital infrastructure.

SGLF firmly believes in the urgent need for good policy to ultimately be realized at the state level. Given the breadth and depth of policy issues state governments face, SGLF's mission has been to help guide and direct the prioritization and dialogue around these issues. Across the ideological spectrum, we have found that the issues confronting stakeholders in state government are becoming more complex and more urgent. This shift has resulted in a new generation of state leadership that is increasingly seeking more intellectually sophisticated policy solutions and strategic advice on implementation. There is no better example of the need for a thoughtful approach to complex policy than those issues presented in this study.

Too often the focus of attention is centered on the federal government in Washington, D.C. where, in recent years, little has been accomplished. Instead, there is a wonderful story to be told in state capitols across the country where leaders from coast to coast have been pioneering bold, conservative solutions in our laboratories of democracy. Throughout my time as Chairman of SGLF, we have attempted to tell that story in highlighting innovative policies that have improved millions of Americans lives. This study continues that legacy and clearly demonstrates the wisdom of state elected leaders in forming policy designed to protect taxpayers while ensuring the innovative age of free-market driven technological change continues to flourish.

SGLF has been and continues to be front and center in the public debate by proactively promoting sound policy throughout the states, by educating the public and state government officials, and by defending key policy ideas, state leaders and legislation when they come under attack. I am proud that this study continues these traditions and look forward to the impact it will have in state capitols across the country.

Congressman Tom Reynolds
Chairman, State Government Leadership Foundation

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Dr. George S. Ford is the Chief Economist of the Phoenix Center for Advanced Legal and Public Policy Studies (www.phoenix-center.org), an internationally-respected Washington D.C.-based non-profit public policy think-tank specializing in the law and economics of the digital age. Since receiving his PhD at Auburn University, Dr. Ford has worked in both the public and private sectors, including positions at the Federal Communications Commission and multiple private communications providers. Dr. Ford has conducted numerous technical business and economic studies—an effort which has resulted in over sixty published journal articles, many more unpublished works, and many internal business reports, some of which drove significant investments in telecommunications infrastructure. Dr. Ford has authored over one hundred reports released by the Phoenix Center. In addition to his publication record, Dr. Ford regularly testifies on economic matters in forums such as the U.S. Congress, the U.S. Copyright Royalty Judges, the Canadian Royalty Board, and numerous state regulatory agencies. Over the years, he has advised governments, both domestic and foreign, consulted to large companies, and delivered academic papers and public addresses at conferences around the world. Dr. Ford is a leading expert in the areas of government regulation, the technology industry, intellectual property, and economic development, advising governments and private parties on issues involving economics, econometrics and business and regulatory strategy. Dr. Ford has studied municipal provision of communications services for over twenty-five years, both in academic research and as a consultant. His research on the topic is frequently cited.

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Broadband Internet service is integrated into nearly every aspect of contemporary American society. In pursuit of broadband's social payoffs, some municipal governments have taken on the enormous financial risk of building and operating their own communications networks in areas where service is not yet available or where deemed by local officials to be inadequate. They do so, it is claimed, "because no one else will." In markets where private firms already provide some level of service, these government-owned and operated systems become "competitors" to the existing private firms, leading to controversy. Opponents of city-run networks view such actions as inherently unfair, a threat to private investment, and risky for taxpayers and captive municipal electric utility ratepayers forced to shoulder millions in financial losses. In response to such concerns, twenty-three states have passed laws overseeing how their political subdivisions enter the communications business, adding fuel to the controversy. Recently, the FCC preempted such laws in the states of Tennessee and North Carolina at the request of cities in those states.

While the debate over government-owned networks is heated, what is lacking is a cohesive economic analysis of the phenomenon. This study attempts to fill that gap by breaking the issue down to its fundamentals by using standard economic concepts and the available evidence. The purpose of this study is neither to encourage nor disparage municipal broadband as a policy option, but rather to provide an economic framework that aids in understanding what municipal broadband is and what it is not; and how one might reasonably support it or how one might reasonably reject it.

The paper's findings may be summarized as follows.

First, municipal broadband is motivated by the alleged social payoffs of the technology. If broadband provided only private benefits, then private action would be sufficient and there would be no policy interest in the issue. The social benefits of broadband accrue neither to broadband providers nor their consumers, but to a third party (i.e., a positive externality). As a consequence of large third-party effects, the private incentives of consumers to pay for and the private incentives of firms to deploy the "right amount" of broadband are systematically too low from a social perspective. Disappointment in the deployment and adoption of broadband leads to public policies aimed at closing this gap. Municipal broadband is one such policy, though the wisdom of the policy is hotly disputed.

Second, the economics predict and the evidence confirms that municipal broadband is in almost all scenarios subsidized entry. In Chattanooga-Tennessee, for example, the city's system received a federal grant equal to about $2,000 per subscriber, while in Bristol-Virginia the subsidies received from various sources equaled about $7,000 per subscriber. Many if not most proponents of municipal broadband acknowledge that without subsidization, municipal broadband is a non-starter. The asymmetric subsidization of a government-owned firm with no regard for profit is a legitimate and serious concern because it presents a serious

threat to private investment in broadband infrastructure and competition and exposes taxpayers and captive municipal electric ratepayers to significant financial risks.

Third, the economics indicate that subsidized municipal broadband is incapable of increasing competition, if competition is measured as the number of firms offering service in a given area. Municipal systems regularly obtain 60% market share and remove a major anchor tenant (the government) from private networks, thereby weakening the economic case for private investment in upgrades. If municipal systems are truly not interested in profit maximization, as is frequently claimed, then municipal entry may be a poison pill for all private sector investment. It may also hasten the exit of private firms from the marketplace, reducing, not increasing, competition if competition is measured by the number of firms.

Fourth, subsidized municipal entry is prone to be predatory. Municipalities operating broadband networks are not, as the Supreme Court observed, acting only "to serve the public weal." Instead, the municipal entrant seeks to capture market share from private sector providers. As such, if one discusses municipal broadband in the context of competition, the asymmetric subsidized entry of a municipal system is better characterized as anticompetitive in nature. Antitrust laws may, surprisingly enough, apply to municipalities offering broadband services, perhaps exposing cities to significant litigation risk.

Fifth, because it is disconnected from profit maximization and asymmetrically subsidized, economic theory suggests that the mere threat of municipal entry can reduce private sector investment. This deterrence effect is particularly pernicious at a time when private providers are undergoing widespread and costly upgrades to their networks. Paradoxically, the resulting lack of private supply may then be used to justify the municipal entry that caused the lack of competition in the first place.

Sixth, economic theory reveals that the unqualified support of municipal broadband as a means to create "more competitors" cannot be supported. Further, the dependence on asymmetric subsidies worsens the welfare consequences because subsidy dollars are expensive; research suggests that every dollar of spending by government costs much more than a dollar to gather and distribute. Hundreds of millions in federal, state and local subsidies have been used to support failed municipal networks.

Seventh, incurring the massive fixed and sunk costs of building one more broadband network, especially with subsidy dollars, is a very inefficient way to obtain the positive externalities of broadband. If subsidies are to be used, theory indicates that subsidies to existing firms to increase output to achieve externalities is likely to be a more efficient approach. Subsidies are continuous and can be fine-tuned and targeted—entry is a clumsy approach in that it is discrete, untargeted, relatively expensive, risky for taxpayers, and arguably predatory.

Eighth, many (but not all) of the provisions of state laws overseeing municipal broadband are seen as having a sound economic basis. Most of these laws attempt primarily to limit the subsidization of municipal systems, to encourage first the pursuit of alternatives to municipal entry, and to protect taxpayers from undue risk (or at least inform them of it, say, by requiring a referendum). In doing so, these laws may very well reduce the likelihood of municipal entry, but they do so for sound reasons. Even laws that prohibit municipal broadband altogether, while admittedly an extreme approach, can be supported by legitimate economic arguments, at least in markets where private providers already provide service.

Finally, broadband is economically important, but most of the economic gains attributed to municipal broadband systems are based on economic migration rather than economic development. For the most part, the economic development from municipal broadband systems is based on stealing businesses from other cities. Certainly, such "economic migration"—as opposed to economic growth—is advantageous to a city, but whatever gains the city obtains from recruiting business is a loss to the city from which that business came. Since there are costs to moving and large costs of building the network, it may be that the migration is net detrimental to society as a whole, even if "privately" profitable to the city. Oddly, the federal subsidies used to encourage economic migration are funded by people in cities losing businesses. While it is easy to see a city's leadership wanting to advantage its city over others, it is not clear why the federal government should be complicit in the act. Business stealing is also not a sustainable policy. A "first mover" advantage is, by definition, not available to late comers. Newer and proposed deployments of municipal systems are perhaps already late to the party; the incentive to migrate to a particular city for high-speed broadband, and the economic gain realized from such migration, gets smaller by the day.

It is fair to say that the basic economics presented here prescribe a heavy dose of caution regarding municipal entry into the communications business. Economics does not, however, offer an unequivocal indictment of municipal broadband. The benefits of broadband Internet service are perceived to be quite large and allegedly include externalities; most of the welfare gains from broadband are obtained with even a single provider. Municipal broadband may have a role to play in broadband deployment in markets where private entry is not profitable, even if municipal entry is heavily subsidized. In markets already served, however, there are potentially more efficient and less controversial alternatives to capture the benefits of broadband service than by forcing an increase in the number of competitors by subsidizing a government-owned firm, which, according to economic theory, is an action better characterized as anticompetitive than it is competitive.

The economic analysis presented here and the fact municipalities are building such systems spotlights the void in sensible federal and state public policies for marginal communities where private incentives may not be as strong as is socially desired. It is perhaps fair to say that municipal broadband should be the last-ditch effort, and it is likely that many cities took it to be so but eventually entered anyway. Desperate times may call for desperate measures, and when the toolkit is limited, the chosen fix may appear to be a kluge. Undoubtedly, desperation is a

lousy climate for good decision-making, but a failure to contemplate this desperation leaves one ignorant of the nature of the municipal broadband phenomenon. In that light, this paper demonstrates that municipal broadband may in part be symptoms of the lack of coherent, economically-informed federal or state policies for broadband deployment and adoption.

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I. Introduction

Broadband Internet service is integrated into nearly every aspect of contemporary American society, perhaps even to a fault. Kids sleep (or not) with their Internet-connected mobile devices under their pillows, mental health professions treat afflictions like Internet Addiction Disorder and Compulsive Internet Use, and half of the nation's ministers are having issues with online pornography.[1] Like all things there are downsides, but broadband Internet connectivity is now seen as essential for modern life, not only because of the significant private benefits to its users, but also because of the alleged sizable social pay off—a "broadband bonus" above and beyond the purely private benefits of the service.[2] Consider the Federal Communications Commission's 2010 *National Broadband Plan*'s take: "Broadband is a platform to create today's high-performance America—an America of universal opportunity and increasing innovation, an America that can continue to lead the global economy, an America with world-leading broadband-enables health care, education, energy, job training, civic engagement, government performance and public safety."[3] While the rhetoric is often melodramatic, broadband is unquestionably very important to consumers for its private benefits and to policymakers for its purported social payoffs, leading some political leaders to label the service a "necessity" and even a "human right."[4] Ubiquitous availability of broadband, if not universal adoption, is now a policy goal.[5]

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[1]   D. Bloomfield, *Kids Who Sleep Near Smartphones Get Less Shuteye: Study,* BLOOMBERG (January 5, 2015) (available at: http://www.bloomberg.com/news/articles/2015-01-05/kids-who-sleep-near-smartphones-get-less-shuteye-study); PSYCHGUIDES.COM, *Computer/Internet Addiction Symptoms, Causes and Effects* (available at: http://www.psychguides.com/guides/computerinternet-addiction-symptoms-causes-and-effects);   B. Lane, *How Many Pastors Are Addicted to Porn? The Stats are Surprising*, EXPASTORS.COM (March 25, 2015) (available at: http://www.expastors.com/how-many-pastors-are-addicted-to-porn-the-stats-are-surprising).

[2]   *See, e.g.*, CONNECTING AMERICA: THE NATIONAL BROADBAND PLAN, Federal Communications Commission (March 16, 2010) (available at: http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-296935A1.pdf) (hereinafter "*National Broadband Plan*"); S. Greenstein & R. McDevitt, *The Broadband Bonus: Accounting for Broadband Internet's Impact on U.S. GDP*, NBER WORKING PAPER NO. 14758 (February 2009)(available at: http://www.nber.org/papers/w14758); T.R. Beard, G.S. Ford, L.J. Spiwak, and M. Stern, *The Broadband Adoption Index: Improving Measurements and Comparisons of Broadband Deployment and Adoption*, 62 FEDERAL COMMUNICATIONS LAW JOURNAL 343-401 (2010) (available at: http://phoenix-center.org/papers/FCLJBAI.pdf).

[3]   *National Broadband Plan*, *id.*, at p. 3.

[4]   *See, e.g., Broadband Opportunity Council Report and Recommendations*, U.S. Department of Agriculture and Department of Commerce (August 20, 2015) (available at: https://www.whitehouse.gov/sites/default/files/broadband_opportunity_council_report_final.pdf) ("Access to high-speed broadband is no longer a luxury; it is a necessity for American families, businesses, and consumers."); *Report of the Special Rapporteur on the promotion and protection of the right to freedom of opinion and expression, Frank La Rue*, United Nations General Assembly, Human Rights Council, A/HRC/17/27 (May 16, 2011) (available at: http://www2.ohchr.org/english/bodies/hrcouncil/docs/17session/A.HRC.17.27_en.pdf); *Finland Makes Broadband a "Legal Right"*, BBC NEWS (July 1, 2010) (available at: http://www.bbc.com/news/10461048); *Internet Access is "A Fundamental Right",* BBC NEWS (March 8, 2010) (available at: http://news.bbc.co.uk/2/mobile/technology/8548190.stm).

Private investment has gone a very long way to providing ubiquitous deployment and about 70% of U.S. homes subscribe to the service.[6] There remains work to be done, however. Nearly 5% of households still can't subscribe to a basic fixed broadband service (the definition of which is fluid) and the capabilities of broadband connections vary widely across the country.[7] Adoption, while high, is still deemed too low, especially in certain segments of the population leading to what is often referred to as the Digital Divide.[8] Working against the lofty goals of policymakers with respect to broadband are a number of factors including variations in consumer demand based on income, education, age,

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[5]   In the U.S., since the passage of the Telecommunications Act of 1996, the ubiquitous availability of broadband connections has been a bi-partisan goal of federal policy. *See, e.g.,* Section 706, 47 U.S.C. § 1302; *see also* N. Mudge, *President Bush Says Universal Broadband by 2007*, GOVTECH.COM (April 2, 2004) (available at: http://www.govtech.com/policy-management/President-Bush-Says-Universal-Broadband-by.html); FACT SHEET: *Broadband That Works: Promoting Competition & Local Choice In Next-Generation Connectivity,* The White House - Office of the Press Secretary (January 13, 2015) (available at: https://www.whitehouse.gov/the-press-office/2015/01/13/fact-sheet-broadband-works-promoting-competition-local-choice-next-gener).

[6]   *National Broadband Plan, supra* n. 2 at p. 3 ("Due in large part to private investment and market-driven innovation, broadband in America has improved considerably in the last decade. More Americans are online at faster speeds than ever before."); *In the Matter of Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996, as Amended by the Broadband Data Improvement Act,* 2015 BROADBAND PROGRESS REPORT AND NOTICE OF INQUIRY ON IMMEDIATE ACTION TO ACCELERATE DEPLOYMENT, FCC 15-10, 30 FCC Rcd 1375 (rel. February 4, 2015) at ¶ 15 and broadband adoption statistics at Table 12 (hereinafter "*2015 Broadband Progress Report*"); ("Private industry continues to invest billions of dollars to expand America's broadband networks. This suggests that the industry recognizes both the value of and the need for continued investment to develop a robust broadband network that will meet consumers' demands."); *In the Matter of City of Wilson, North Carolina, Petition for Preemption of North Carolina General Statute Sections 160A-340 et seq.; The Electric Power Board of Chattanooga, Tennessee, Petition for Preemption of a Portion of Tennessee Code Annotated Section 7-52-601,* FCC 15-25, MEMORANDUM OPINION AND ORDER, 30 FCC Rcd 2408, (rel. March 12, 2015) at ¶ 3 ("The private sector has invested billions of dollars upgrading their broadband networks throughout the United States, and current deployment data indicate that 92% of Americans in urban areas, and 47% in rural areas, have access to fixed broadband with speeds of at least 25/3 Mbps.") (hereinafter "*2015 Preemption Order*"); A. Perrin and M. Duggan, *Americans' Internet Access: 2000-2015,* PEW RESEARCH CENTER FOR INTERNET, SCIENCE & TECHNOLOGY (June 26, 2015) (available at: http://www.pewinternet.org/2015/06/26/americans-internet-access-2000-2015). On mobile broadband adoption, A. Smith, *U.S. Smartphone Use in 2015*, Pew Research Center for Internet, Science and Technology (April 1, 2015) (available at: http://www.pewinternet.org/2015/04/01/us-smartphone-use-in-2015); *Remarks by Chairman Wheeler at Georgetown University*, Federal Communications Commission (March 21, 2016) (available at: https://www.fcc.gov/document/remarks-chairman-wheeler-georgetown-university).

[7]   *2015 Broadband Progress Report, id.* at Chart 2; J. Wenz, *The FCC Has Defined Broadband as 25 Mbps*, POPULAR MECHANICS (January 29, 2015) (available at: http://www.popularmechanics.com/culture/web/a13716/fcc-changes-broadband-definition-25-mbps/); M. Reardon, *Sorry, Your Broadband Internet Technically Isn't Broadband Anymore*, CNET (January 29, 2015) (available at: http://www.cnet.com/news/sorry-your-broadband-internet-technically-isnt-broadband-anymore).

[8]   *Exploring the Digital Nation - Computer and Internet Use at Home*, National Telecommunications Information Administration ("NTIA") (November 9, 2011) (available at: http://www.ntia.doc.gov/files/ntia/publications/exploring_the_digital_nation_computer_and_internet_use_at_home_11092011.pdf).

perceived value, and so forth, and the high deployment and operating costs of broadband networks.[9]

In pursuit of broadband's social payoffs, some municipal governments have taken on the enormous financial risk of building and operating their own communications networks in order to provide telephone, video and high-speed Internet connectivity to their constituents (and in some persons beyond the municipal boundaries). These government-owned networks ("GONs") are most often being built in areas where communications services are not available or where the connection speeds and market coverage of existing private providers are deemed by local officials to be inadequate.[10] Municipal governments generally have no interest in constructing and operating a communications network and most cities will never even consider it, yet out of desperation for modern communications services (i.e., very high-speed broadband) and the benefits they are believed to provide a few hundred cities are doing so.[11] In markets where private firms already provide some level of service, these government-owned and operated systems become "competitors" to the existing private firms, typically amassing significant market share and serving most if not all government buildings.

Not surprisingly, these municipal broadband systems are highly controversial. Opponents contend that having to compete with the government is inherently unfair.[12] Opponents also claim that the presence of a government-owned firm threatens private investment, a position supported by the *National Broadband Plan* and economic theory. A number of high-profile failures, forcing taxpayers and captive municipal electric utility ratepayers to shoulder millions in financial losses, provide potent warning regarding the

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[9]   *Id.*

[10]   These areas are often referred to as "underserved" communities. *See, e.g., 2015 Broadband Progress Report*, *supra* n. 6; H. Schaub and D. West, *Broadband Alternatives in Unserved and Underserved Areas*, BROOKINGS TECHTANK (May 23, 2014) (available at: http://www.brookings.edu/blogs/techtank/posts/2014/05/23-broadband-alternatives-underserved-areas-schaub);

[11]   *Municipal Networks Will Not Wire U.S. for Broadband*, SPEEDMATTERS.ORG (undated) (available at: http://www.speedmatters.org/blog/archive/municipal-networks-will-not-wire-u.s.-for-broadband); A similar point is made by Harold DePriest, head of Chattanooga's municipal broadband system, at a hearing before the Tennessee State Legislature ("This stuff is not cheap, it is not easy, and [] I'm not really telling you that every community is going to run out and build broadband, that doesn't make sense to me (at 8:32)") (available at: https://www.youtube.com/watch?v=oRtzmNMGILo&index=19&list=FLeDkoYbc2YqmOTN6BcfUoJQ); M. Zager, *Census of Community Fiber Networks Rises to 165*, BROADBAND COMMUNITIES (August/September 2015)(available at: http://www.bbpmag.com/Features/0815Census-of-Community-Fiber-Networks-Rises-to165.php); *Community-Based Broadband Solutions the Benefits of Competition and Choice for Community Development and Highspeed Internet Access*, Executive Office of the President (January 2015)(available at: http://muninetworks.org/sites/www.muninetworks.org/files/White-House-community-based-broadband-report-by-executive-office-of-the-president_1.pdf); http://muninetworks.org/communitymap.

[12]   This "unfair" concept has many elements including debt costs, tax advantages, and so forth. For example, in some instances, municipal broadband systems do make payments to the city (but not usually to the state or federal governments) that are analogous to taxes. City systems may also face requirements that private providers do not.

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risks and likely consequences of such ventures.[13] Such arguments have proven compelling: twenty-three states have passed laws overseeing how their political subdivisions enter the communications business.[14] In a few cases, cities are prohibited by law from doing so. Like municipal broadband itself, these laws are highly controversial and there is a movement afoot to have them either repealed or preempted by the federal government. Recently, the FCC preempted such laws in the states of Tennessee and North Carolina at the request of cities in those states.[15] In all likelihood, the FCC's preemptive action will not withstand judicial scrutiny,[16] but its actions confess to the intense political nature and emotional investment in this issue. Cheered on by the Obama Administration, the push for municipal broadband is as strong as ever.[17] Whether they want to or not, state legislatures will be addressing the question of municipal broadband networks, and the laws they have or have not passed, for years to come.

While the controversy surrounding municipal broadband has generated a rich, varied and informative literature on the phenomenon, what appears to be missing is a careful

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[13] *See, e.g.,* C. Davidson and M. Santorelli, *Understanding the Debate over Government-Owned Broadband Networks: Context, Lessons Learned, and a Way Forward for Policy Makers – Chattanooga Case Study*, New York Law School (June 2014) (available at: http://www.nyls.edu/advanced-communications-law-and-policy-institute/wp-content/uploads/sites/169/2013/08/ACLP-%E2%80%93-Chattanooga-Case-Study-%E2%80%93-June-2014.pdf); D.G. Tuerck and J. Barrett, *Municipal Broadband in Concord: An In-Depth Analysis*, BHI POLICY STUDY (March 2004) (available at: http://www.beaconhill.org/BHIStudies/ConcordCable.pdf); R.J. Rizzuto, *Cashing in On Cable: Warning Flags for Local Government*, Beacon Hill Institute (2001) (available at: http://www.beaconhill.org/BHIStudies/BHIcablestudy103001.pdf); *Financial Performance of Tennessee's Municipal Cable and Internet Overbuilds in 2009*, Working Paper (February 25, 2010) (available at: http://media.timesfreepress.com/docs/2010/05/Rizzuto_report_on_Tennessee_telecoms.pdf); S. Arrrison, R. Rizzuto, and V. Vasquez, *Wi-Fi Waste: The Disaster of Municipal Communications Networks*, Heartland Institute (February 2007) (available at: https://www.heartland.org/sites/all/modules/custom/heartland_migration/files/pdfs/20849.pdf); J. Valvo, *Municipal Broadband's Record of Failure*, AMERICANS FOR PROSPERITY POLICY PAPER No. 0309 (March 2009) (available at: http://americansforprosperity.org/files/Municipal_Broadband_Policy_Paper.pdf); J.P. Fuhr, *The Hidden Problems with Government-Owned Networks*, Coalition for the New Economy (2012)(available at: http://www.coalitionfortheneweconomy.org/wp-content/uploads/2012/01/1-6-12-Coalition-for-a-New-Economy-White-Paper.pdf).

[14] *See, e.g.,* S. Lichtenberg, *Municipal Broadband: A Review of Rules, Requirements, and Options*, NRRI REPORT NO. 14-11, National Regulatory Research Institute (November 2014) (available at: https://pensacolabroadband.files.wordpress.com/2015/08/11-2014-municipal-broadband-a-review-of-rules-requirements-and-options.pdf); *Comments of the Coalition for Local Internet Choice (Appendix)*, WC Docket No. 14-116 (August 29, 2014) (available at: http://apps.fcc.gov/ecfs/document/view;NEWECFSSESSION=Z2h2Wh7Ytt5SXkcGyfL8hny1gcl33YwpLqdhWmmW0Glqs22bmcCq!-729788805!-681833196?id=7521826171).

[15] *2015 Preemption Order, supra* n. 6. As of this writing, the *2015 Preemption Order* is on appeal before the Sixth Circuit as *The State of Tennessee et al. v. FCC & USA* (Case No. 14-3291).

[16] For a thorough critique of this *Order*, *see* L.J. Spiwak, *The FCC's New Municipal Broadband Preemption Order Is Too Clever By Half*, BLOOMBERG BNA (April 10, 2015) (available at: http://www.phoenix-center.org/oped/BloombergBNATennesseePreemptionOrder10April2015.pdf).

[17] J. Fingas, *Comcast's Gigabit Internet Should be Widely Available by 2018,* ENGADGET (August 24, 2015) (available at: http://www.engadget.com/2015/08/24/comcast-gigabit-internet-us-wide-by-2018).

economic analysis of the underlying nature of municipal broadband and its advocacy,[18] and why we see government entry in an industry where private investment is abundant.[19] In this paper, I try to fill that gap. As I see it, the economic essence of municipal broadband can be boiled down to a simple question: *why is the municipality the only one willing to build the network*? Evidently, the answer is "*because no one else will*."[20] This question and its restatement as an answer help frame up the economic analysis of the issue, or at least key parts of it.

The reader should be aware, however, that my effort is admittedly and necessarily modest. It is unlikely that a single exercise will tell us all we need to know about the advisability of municipal entry in cities as diverse as Seattle-Washington (population 670,000), Chattanooga-Tennessee (population 173,000), Barbourville-Kentucky (population 3,200), Lenox-Iowa (population 1,359) and American Samoa (population 55,000).[21] Admittedly, my analysis may lead to more questions than answers, but I do believe the contemplation of these new questions will improve policy making in this space. As is posted on the reading room door at Tromsø University in Sweden: "We have not succeeded in answering all our problems. The answers we have found only serve to raise a whole set of new questions. In some ways we feel we are as confused as ever, but we believe we are confused on a higher level and about more important things."[22]

II. Summary of Findings

My analysis relies heavily on (somewhat basic) economic theory, so my findings are general in nature.[23] Nevertheless, much of the evidence and anecdote on municipal

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[18]   A list of numerous studies is maintained at: http://muninetworks.org/reports.

[19]   *See supra* n. 6; *see also* M. Mandel, *Investment Heroes of 2015: Why Innovation Drives Investment*, Progressive Policy Institute (September 2015) (available at: http://www.progressivepolicy.org/issues/economy/u-s-investment-heroes-of-2015-why-innovation-drives-investment).

[20]   This "no one else will" sentiment is widely held. *See*, *e.g*., A.S. Hammond, IV and C. Raphael, *Municipal Broadband: A Background Briefing Paper*, "Broadband for All" Conference – Santa Clara University (September 2006) (available at: https://digii.files.wordpress.com/2008/02/a-background-briefing-paper.doc); Liveblog: H129 Municipal Broadband Hearing (North Carolina), WRAL.com (May 23, 2011) (available at: http://www.wral.com/news/state/nccapitol/blogpost/9313335); *US Lagging Behind in Broadband*, GRID Internet & TV Blog (May 23, 2011) (available at: http://gridcommunications.net/lagging-broadband);

[21]   Zager, *supra* n. 11; *Broadband Study*, City of Seattle (June 2015) (available at: http://www.seattle.gov/broadband/broadband-study). Population data from the U.S. Census Bureau.

[22]   The quote originally appeared in E.C. Kelley, THE WORKSHOP WAY OF LEARNING (1951).

[23]   I have studied municipal provision of communications services, on and off, for over twenty-five years, both as an academic exercise and as a consultant. In fact, some of my research on the topic is frequently cited in the debate, and usually by the municipal broadband advocates. *See* G.S. Ford, *Does a Municipal Electric's Supply of Communications Crowd Out Private Communications Investment? An Empirical Study*, 29 ENERGY ECONOMICS 167-478 (2007) (available at: http://sites.udel.edu/broadbandplanning/files/2012/01/MunicipalCommunicationsSupply_2006.pdf); G.S. Ford and T.M. Koutsky, *Broadband and Economic Development: A Municipal Case Study from Florida*, 17 REVIEW OF URBAN & REGIONAL DEVELOPMENT STUDIES 216–229 (2005) (available at: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=925973); T.W. Hazlett and G.S. Ford, *The Fallacy of*

broadband fits nicely into this general framework. The economics also have a long-run view, revealing the underlying yet powerful forces that produce outcomes. Much of the evidence has a decidedly short-run view, whether for or against municipal broadband.[24] While there is always the possibility of the exceptional anecdote showing a short-run departure from prediction, policy should not be based solely (if at all) on anecdote and naïve, short-run considerations. Systematic departures of the evidence from the theory presented here, if they occur, point to areas for further research.

My purpose is not to disparage or promote municipal broadband as a policy option, but rather to provide an economic framework that aids in understanding what municipal broadband is and what it is not; and how one might reasonably support it or how one might reasonably oppose it. Municipal broadband is a complex issue, and this paper is but one entry into a portfolio of analysis and evidence on the topic (much of which remains to be done).

My findings may be summarized as follows.

First, the exceedingly high standards set for ubiquitous deployment and universal adoption of broadband are not based on the private benefits of the service, but on the *social benefits* of it. If private benefits were all broadband offered, then there would be little policy interest in expanding the availability and adoption of broadband.[25]   The distinction between private and social benefits is critical. The social benefits of broadband accrue neither to broadband providers nor their consumers, but to a third party. Thus, broadband policy is motivated by a positive externality.[26] Consumers are not inclined to pay for benefits that accrue to others, and firms aren't interested in benefits that don't affect revenues and profits.[27] As a consequence of positive third-party effects (to the extent they exist), the private incentives of consumers to pay for and the private incentives of firms to deploy the "right amount" of broadband are systematically *too low* from a social perspective.   As such,   when   evaluating   broadband   from   a   social   viewpoint,

Regulatory Symmetry, 3 BUSINESS AND POLITICS 21-46 (2001), which is not a paper about municipal broadband but is nonetheless frequently cited in the debate.

[24]   Building a communications networks requires sizable upfront investments, thus ensuring the builder will incur losses in the early years of operation. Such losses are not an indictment of the network. Profits must be evaluated over many years using discounting analysis.

[25]   Governments may be used for the purpose of manipulating markets to obtain advantages for one party or another, but I ignore these purely political motivations.

[26]   D.W. Pearce, DICTIONARY OF MODERN ECONOMICS (1989) ("Externalities involve an interdependence of utility and/or production functions. [] For example, a beekeeper may benefit neighboring farmers by incidentally supplying pollination services. [] A distinction is drawn between marginal and inframarginal externalities. In the former small changes in the level of the externality-generating activity will affect the production or utility of the externally affected party. In the latter, while the activity itself generates an externality, small or marginal changes in the level of the activity do not have any effect on the production or utility of the externally-affected party. A Pareto-relevant externality occurs when the extent of the activity may be modified in such a way that the externally-affected party can be made better off without the acting party being made worse off, that is, where there exists the possibility of gains from trade."

[27]   B.J. Lobo, A. Novobilski, and S. Ghosh, *The Impact of Broadband in Hamilton County, TN*, Working Paper (March 20, 2006) (available at: https://www.epb.net/downloads/legal/EPB-FCCPetition-Exhibits.pdf) ("These positive externalities are unlikely to be considered by private providers when making FTTH deployment decisions.").

disappointment in the deployment and adoption of broadband is guaranteed absent an effective policy to close the gap between private and social benefits. Competition is not a solution to the externality problem, so the competition justification for municipal broadband is where the advocacy is misguided. Traditionally, externalities are dealt with by using subsidies to alter private incentives so that they coincide with the social perspective, thereby increasing consumer welfare.

Second, the economics predict (and the evidence confirms) that municipal broadband is in almost all scenarios *subsidized entry*, covering capital costs and losses with tax dollars and other internal transfers. Advocates of municipal broadband do not generally contest this fact. In Chattanooga-Tennessee, for example, the city's system received a federal grant equal to about $2,000 per subscriber, and millions more in subsidies from the city's captive electric ratepayers. In Bristol-Virginia, direct subsidies received from various sources equaled about $7,000 per subscriber. In fact, many if not most proponents of municipal broadband acknowledge that without subsidization, municipal broadband is a non-starter. Indeed, some state laws are criticized, including the North Carolina law that the FCC recently preempted, because these laws attempt to limit subsidization and thereby serve, it is claimed, as an entry barrier. While subsidies may be a solution to an externality problem, the asymmetric subsidization of municipal entrants (or any entrant) is a legitimate and serious concern. Entry by a subsidized government-owned firm with no regard for profit reduces the incentives of private firms to invest in modern communications infrastructure and may reduce consumer welfare.

Third, the economics indicate that subsidized municipal broadband is incapable of increasing competition, if competition is measured as the number of firms offering service in a given area. The number of providers in a market is determined by economic forces, not the whims of federal, state or city politicians.[28] In the long run, the number of firms that can profitably serve a market is what it is, so eventually either the municipal entrant will fail or a private-provider will exit or materially reduce its investments. Evidence suggests that municipal systems regularly obtain significant market shares and often remove a major anchor tenant (the government) from private networks, thereby weakening the economic case for private investment in upgrades. If municipal systems are truly not interested in profit maximization, as is frequently claimed, then municipal entry may be a poison pill for all private sector investment.[29]

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[28]   Certainly, governments can impose laws and regulations that restrict the number of competitors, but adding competitors to a market equilibrium is extremely difficult and is certain to require some type of subsidization.

[29]   H. Rosoff, *Tacoma Could be First Major Washington City with Publicly-Owned Broadband Network*, KIRO7.COM (November 30, 2015)(quoting Tacoma Public Utility Board Chairman Bryan Flint: "Publicly-run means we don't have a profit motive") (available at: http://www.kirotv.com/news/news/utility-board-tacoma-council-decide-click-cable-tv/npY6z); D. St. John, *Municipal Fiber to the Home Deployments: Next Generation Broadband as a Municipal Utility*, Fiber to the Home Council (April 2008) (available at: http://community-wealth.org/sites/clone.community-wealth.org/files/downloads/article-st-john.pdf)   ("In the case of muni systems, which are not-for-profit enterprises, one measure of "success" is defined as the level of their "take rate"—that is, the percentage of potential subscribers who are offered the service that actually do subscribe (at 3)"); J. Engebretson, *Broadband Payback Not Just About Subscriber Revenues*, CONNECTED

Fourth, and following from the prior findings, subsidized municipal entry is prone to be predatory (i.e., prices below incremental cost). Municipalities operating broadband networks are not, as the Supreme Court observed, acting only "to serve the public weal."[30] Instead, the municipal entrant seeks to capture market share from private sector providers. As such, if one discusses municipal broadband in the context of competition, the asymmetric subsidized entry of a municipal system is better characterized as anticompetitive in nature. Antitrust laws may, surprisingly enough, apply to municipalities offering broadband services, perhaps exposing cities to significant litigation risk.

Fifth, because municipal systems are disconnected from profit maximization and asymmetrically subsidized, the mere threat of municipal entry can reduce private sector investment. This deterrence effect is particularly pernicious at a time when private providers are undergoing widespread and costly upgrades to their networks. Paradoxically, the resulting lack of private supply may then be used to justify the municipal entry that caused the perceived lack of competition in the first place.

Sixth, economic theory reveals that the unqualified support of "more competitors" cannot be supported. As is well-documented in the economics literature, as a consequence of profit maximization and fixed costs, free entry into a market typically leads to excessive, not too little, entry. It may be a bitter pill to swallow when consumers face relatively few suppliers, but the risk of welfare-reducing entry are particularly acute in broadband markets. Lower prices (and thus higher quantities) must be paid for by the high-cost of building a new network. Thus, the consumer welfare implications of forced entry via municipal broadband may very well be unfavorable. The dependence on asymmetric subsidies worsens the welfare consequences because subsidy dollars are expensive; research suggests that every dollar of spending by government costs much more than a dollar to gather and distribute. Hundreds of millions in federal subsidies have been used to support municipal networks and is well known that the federal budget deficits and federal spending are out of control.

Seventh, given the above, some (but not all) of the provisions of state laws overseeing municipal broadband are seen as having a sound economic basis. Many of these laws attempt primarily to limit the subsidization of municipal systems, to encourage first the pursuit of alternatives to municipal entry, and to protect taxpayers from undue risk (or at least inform them of it, say, by requiring a referendum). In doing so, certain provisions may very well reduce the likelihood of municipal entry, but they do so for sound economic

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PLANET (January 6, 2011) (available at: http://muninetworks.org/content/broadband-payback-not-just-about-subscriber-revenues)("in doing a cost/benefit analysis on telecom infrastructure investment, it's important to take into account not only the direct revenues that the infrastructure generates but also the dollars that flow into a community as a result of the investment.*)*; M. Halverson, *Disbanded: No Broadband Utility for Seattle*, SEATTLE MET (June 20, 2012) (available at: http://www.seattlemet.com/articles/2012/6/20/disbanded-no-broadband-utility-for-seattle-july-2012)("A municipal network should be evaluated on the same basis of how we evaluate roads and other infrastructure," says Christopher Mitchell, founder of muninetworks.org, which tracks community broadband issues. "Which is to say that the point of the road is not to produce revenue for the general fund. It's to produce economic development and other benefits.").

[30]   *City of Lafayette v. Louisiana Power & Light Company,* 435 U.S. 389, 402 (1978).

and policy reasons. Even laws that prohibit municipal broadband altogether, while admittedly an extreme approach, can be supported by legitimate economic arguments, at least in markets where private providers already provide service.

Eighth, a shift to the "positive externality" motivation for municipal broadband in marginal markets is very informative and has the advantage of being logically sound. Still, incurring the massive fixed and sunk costs of building one more broadband network, especially with subsidy dollars, is a very inefficient way to obtain the alleged positive externalities of broadband. If subsidies are to be used, theory indicates that subsidies to existing firms to increase output to realize externalities is likely to be a more efficient approach. Subsidies are continuous and can be fine-tuned and targeted—entry is a clumsy approach in that it is discrete, untargeted, relatively expensive, risky for taxpayers, and arguably predatory.

Finally, broadband is economically important, but most of the economic gains attributed to municipal broadband systems are based on economic migration rather than economic development. For the most part, the economic development from municipal broadband systems is based on stealing businesses from other cities. Certainly, such "economic migration"—as opposed to economic growth—is "privately" advantageous to a city, but whatever gains the city obtains from recruiting business is a loss to the city from which that business came. Since there are costs to moving and large costs of building the network, it may be that the migration is net detrimental to society as a whole. Oddly, the federal subsidies used to encourage economic migration are funded by taxpayers in cities losing businesses. While it is easy to see a city's leadership wanting to advantage its city over others, it is not clear why the federal and state governments should be complicit in the act. Business stealing is also not a sustainable policy. A "first mover" advantage is, by definition, not available to late comers. Newer and proposed deployments of municipal systems are perhaps already late to the party; the incentive to migrate to a particular city for high-speed broadband, and the economic gain realized from such migration, gets smaller by the day.

It is fair to say that the basic economics presented here prescribe a heavy dose of caution regarding municipal entry into the communications business, perhaps explaining why much of the debate is political rather than economic in nature. Economics does not, however, offer an unequivocal indictment of municipal broadband. The benefits of broadband Internet service are perceived to be quite large and include externalities, and most of the welfare gains from broadband are obtained with even a single provider. Municipal broadband may have a role to play in broadband deployment in markets where private entry is not profitable, even if municipal entry is subsidized heavily. In markets already served, however, there are *potentially* more efficient and less controversial alternatives to capture the benefits of broadband service than by forcing an increase in the number of competitors by subsidizing a government-owned firm, which, according to economic theory, is an action better characterized as anticompetitive than it is competitive.

The economic analysis presented here and the fact municipalities are building such systems spotlights the void in sensible federal and state public policies for marginal communities where private incentives may not be as strong as is socially desired. It is perhaps fair to say that municipal broadband should be the last-ditch effort, and I suspect

that many cities took it to be so but eventually built a network anyway.[31] Desperate times may call for desperate measures, and when the toolkit is limited, the chosen fix may appear to be a kluge. Undoubtedly, desperation is a lousy climate for good decision-making,[32] but a failure to contemplate this desperation leaves one ignorant of the nature of the municipal broadband phenomenon. In that light, municipal broadband may be a symptom of the lack of a coherent, economically-informed federal (and state) policy for broadband deployment and adoption in economically-marginal communities.

III.   The Economics of the Broadband Bonus

If one were to condense the *National Broadband Plan* down to a single sentence, it might look something like this: *broadband is really important and we need people to use more of it*.[33] Broadband's importance stems from both its private value and its social value, but it is the social value that drives the need for social policy. While activities are not always easily categorized as one or the other, the *Plan's* depiction of broadband as a "platform to create today's high-performance America" suggests that the Internet is useful for more than just shopping and watching high-definition movies and cat videos (which provide benefits primarily of a *private* nature). Downloading a movie in five seconds rather than five minutes is a private issue, not a social good worthy of taxes and subsidies.[34] Alternately, widespread broadband use may permit governments, school systems and healthcare providers to operate more efficiently and at lower costs by conducting business online, and these efficiencies may be viewed as rendering social benefits not fully captured by private parties. In this paper, I will use the term "positive externality" to account for those uses that produce a benefit above and beyond what consumers are willing to pay for themselves and what firms can turn into revenues.[35]

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[31]   *Oregon Municipal Broadband*, League of Oregon Cities (July 2011) at p. 30 (available at: http://www.orcities.org/Portals/17/Headlines/BroadbandReport%20July%202011%20FINALforWEB.pdf)("In 1999, the cities of Monmouth and Independence asked their local cable company when high-speed Internet would be introduced to the cities. The cities were told services would be available no sooner than 2020. With the new millennium approaching, both cities realized that to be economically viable, high-speed Internet services were desperately needed. Accordingly, the two cities conducted a feasibility study regarding an intergovernmental broadband network. This study also included a public survey, which showed that the citizens of Monmouth and Independence were receptive to the idea of a municipal broadband utility. Furthermore, a major client was eager to receive better telecommunications services, Western Oregon University. These and other factors illustrated to the two city councils that a municipal broadband utility was a viable and necessary project.").

[32]   *See, e.g.,* R. Beard, *Bankruptcy and Care Choice*, 12 RAND JOURNAL OF ECONOMICS 626-634 (1990).

[33]   *National Broadband Plan, supra* n. 2; B. Levin and D. Linn, *The Next Generation Network Connectivity Handbook: A Guide for Community Leaders Seeking Affordable, Abundant Bandwidth*, Gig.U: The Next Generation Network Innovation Project (July 2015) (available at: http://www.gig-u.org/cms/assets/uploads/2015/07/Val-NexGen_design_7.9_v2.pdf).

[34]   It could be argued that such a difference may serve as a recruitment device for a city, but this does not contribute to any social net gain. Whatever benefits arise from one city recruiting a business is offset by the loss to the community from which the business originated.   In fact, the recruitment motivation for cities is likely to be welfare reducing in that it encourages the premature deployment of new networks.

[35]   What online activities may fully qualify as an externality, in any formal sense, is debatable.

An important aspect of a positive externality is that such benefits accrue neither to broadband providers nor their consumers but to a third party. Consumers are not inclined to pay for benefits that accrue to others. Likewise, firms are profit maximizers, so any benefit that does not affect revenues and profits does not impact its decisions. In the presence of a positive externality, the private incentives of consumers to pay for and the private incentives of firms to deploy the "right amount" of broadband are a *too low* from a social perspective. This lack of attention to the full social values of broadband to others results because consumers or the veil we call a "firm" that masks a group of consumers, are normally willing to pay only for benefits they receive. Altruism is noble, but not universal. The wedge between private and social benefits is the source of the dissatisfaction with both the deployment of and adoption of broadband service, and this displeasure in turn drives a heightened attention to broadband policy. All the wishful thinking, complaining, and name calling people can muster won't close this gap; only a change in the economics of deployment and adoption will make the difference. Municipal broadband does not alter the economics of broadband but ignores them.

A. *The Externality Issue*

Figure 1 illustrates the nature of the externality problem using the basic supply-demand graph, where quantity is measured along the horizontal axis and price along the vertical axis.[36] The private demand for the good is the downward sloping curve labeled D. Given constant cost and perfect competition, the equilibrium quantity based on private incentives alone is Q_P, where demand and long-run supply (S) intersect. Assuming the good produces a positive externality of value E, the social demand curve is the downward sloping curve labeled D + E, which is shifted up and to the right by the amount E to account for the positive externality. For society, which includes the third parties receiving the external benefit, the desired quantity is Q_E. When accounting for the externality, private incentives produce a quantity that is too low (by the amount Q_E less Q_P). By subsidizing consumers by an amount equal to E, the effective demand of the consumers seen by the sellers is now D + E, so the externality problem is resolved and Q_E becomes the equilibrium quantity.[37]

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[36] For a discussion of the economics of externalities, *see* R.B. Ekelund and R.D. Tollison, ECONOMICS: PRIVATE MARKETS AND PUBLIC CHOICE (1999) or most other basic economic textbooks; T. Helbling, *What Are Externalities*, 47 FINANCE & DEVELOPMENT 48-49 (December 2010) (available at: http://www.imf.org/external/pubs/ft/fandd/2010/12/basics.htm).

[37] A subsidy to the firms of the same amount would lower the perceived marginal cost, thus increasing quantity by the same amount.

Figure 1. Effect of Externalities
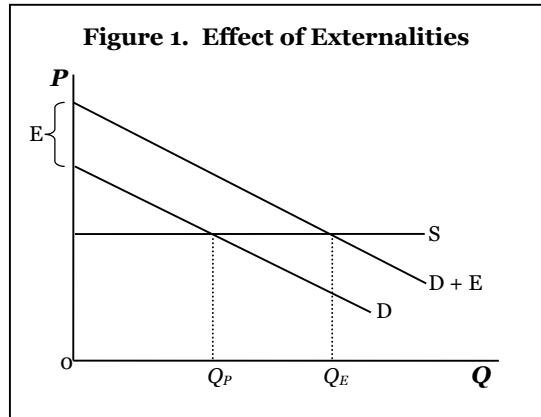
If the private incentives of consumers and producers produce too little quantity by a failure to internalize the externality, then a subsidy is a policy solution. (Taxes are used to solve the negative externality problem.) Broadband service is believed to provide positive externalities and these externalities lead to calls for ubiquitous deployment and universal adoption. Yet, because these goals are based on social rather than private gains, neither goal will be met without some type of intervention. In this simple scenario, that intervention is a subsidy.[38]

B. *Competition is Not the Solution to Externalities*

The fact that quantity is too low in the presence of a positive externality is the source of much confusion in the broadband policy sphere, especially with regard to municipal broadband. Specifically, basic economics indicates that competition reduces prices and, in turn, increases quantity by the law of demand. This leads to the belief that if quantity is "too low," then an increase in competition is a suitable solution. It is not. Indeed, in Figure 1, perfect competition is assumed, and yet quantity remains too low. Competition is not a solution to the externality problem; no amount of competition will close the gap between the private and socially desired quantity. Calls simply to "promote competition" are plainly off base and reflects an ignorance of the true nature of the problem and its solution.[39]

That said, with respect to wireline markets, it's not difficult to see where the lust for competition comes from, even if in error. As shown in Table 1, FCC data from 2013 (the latest available) indicates that many household are not overwhelmed with choices when it comes to wireline broadband providers.[40] In the table, three different "speeds" are provided, which are rough approximations of connection quality or capability. At the lowest speed of 3 Mbps down and 768 kpbs up, households do have quite a few options, with two-thirds of homes having access to three or more providers. That leaves about one-

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[38]   A subsidy intervention may involve the public supply of the good or service, as with public education.

[39]   Available at: https://apps.fcc.gov/edocs_public/attachmatch/FCC-15-62A2.pdf.

[40]   *2015 Broadband Progress Report, supra* n. 6 at Chart 2.

third with two or fewer options. As speeds rise, options fall. The FCC presently defines "broadband service" as having a minimum of 25 Mbps down and 3 Mbps up. At these higher speeds, a household's options are even more limited, with 61% of homes having one or no provider. If one assumes that the number of providers is a useful measure of competition, then it is not difficult to see why competition arguments are used to drive public policy.[41] Nevertheless, the focus on competition is misplaced. Competition cannot solve the externality problem. No amount of competition is going to lead to ubiquitous deployment, since there are many markets where even a monopolist can't earn a return large enough to justify the necessary investments.

Table 1. Fixed Broadband Providers by Household (2013)			
	3 Mbps/768 kpbs	10 Mbps/768 kpbs	25 Mbps/3 Mpbs
No Provider	3%	5%	16%
1 Provider	9%	21%	45%
2 Providers	22%	36%	27%
3+ Providers	66%	38%	12%

A review of the vast literature on municipal broadband reveals the same confusion between the effect of *positive externalities* and of *competition*. Positive externalities are realized when people "consume" broadband, and the more they consume of it, the larger is social well-being (i.e., consumer welfare, economic welfare, or social welfare). Municipal broadband networks do not solve the externality problem by competing with the private sector. *To solve the externality problem, we need more quantity, not more firms.* Adding more sellers to the market does not address the underlying problem, because that problem is a wedge between private and social values. In the absence of a subsidy, firms, no matter their count, are only concerned with private values. Certainly, in the presence of excessive market power, additional competition may bring down prices. Even so, these marginal reductions in price can never solve the real problem—that is, the externality problem. How these price reductions are obtained is also important, and I address that question in more detail in the following sections.

With regards to the externality issue, federal policy is not entirely off track, it's just incomplete. Recently, the FCC created and is now administering a subsidy program for broadband deployment in which private providers are paid to deploy broadband in demonstrably uneconomic areas. The Connect America Fund ("CAF") program is focused almost exclusively on areas that are not served at all (or served with very low speed connections).[42] Yet, the externality exists everywhere (if it exists at all).

As shown in Table 1, private incentives are sufficient for the deployment of high-speed networks, and usually multiple networks, in most cities and places across the country. Yet, adoption may remain too low by social standards. Where broadband is not available, the FCC has stepped in to subsidize broadband deployment (by a single firm), but only in the

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[41]   In fact, there is an argument to make that the FCC's definition of broadband was intended to make competition appear anemic.

[42]   Details on the FCC's Connect America Fund may be found at: https://www.fcc.gov/encyclopedia/connecting-america.

most uneconomic markets. Private incentives and the FCC's narrow focus will have the side effect of creating a "valley of death" in some areas that do not qualify as unserved but are also not served in a manner some people may determine to be adequate (i.e., they are "underserved").[43] This problem already exists today, and (I believe) is the source of the municipal broadband phenomenon. Today, there is no federal policy to address the shortfall in private incentives that may exist in areas where service is provided but not at a level some deem sufficient for modern times. As such, cities are left to their own devices to solve the problem often with only the crudest of tools. Enlightened management of rights-of-way and using the government as an anchor tenant for private providers may be effective tools in some areas, but may not always be adequate to induce the widespread availability of very high-speed broadband networks at privately uneconomic prices. A lack of sufficient private incentives, and government programs to resolve that shortfall, the municipal network arises as an apparent solution. Municipal broadband does not, however, address the fundamental uneconomic nature of the investment.

C. *Municipal Systems in the Valley of Death*

A review of where municipal broadband has been deployed says much about the issue.[44] In Figure 2, the quartile distribution of the populations of cities listed in a recent census of fiber municipal broadband networks is shown.[45] From this figure, we see that 82% of systems in the survey are in cities with less than 50,000 in population (or about 20,000 homes).[46] About 60% of these communities had populations less than 25,000 (10,000 homes), about half had populations less than 18,000 (7,200 homes), and one-third have populations less than 10,000 (5,000 homes). Municipal networks are being built mostly in smaller communities, many of them with a significant rural footprint, where the costs of upgrades may not be justifiable on purely private incentives alone.[47] While there are some deployments in larger cities (Chattanooga, for example), they are relatively few and they may be explainable by special economic (or political) considerations.
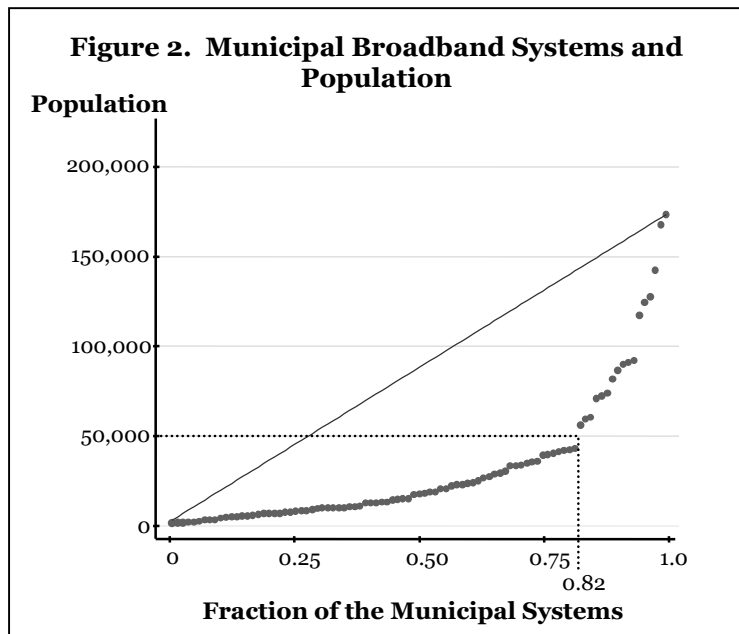
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[43]   Non-economic activities by the government create "valleys of death" in other areas as well. *See* T.R. Beard, G.S. Ford, T.M. Koutsky, and L.J. Spiwak, *A Valley of Death in the Innovation Sequence: An Economic Investigation*, 18 RESEARCH EVALUATION 343-356 (2009).

[44]   Population is a relevant but relatively crude measure of the economics of deployment.

[45]   *See* Zager, *supra* n. 6. The data is limited to cities that offer residential services.

[46]   The average U.S. household has 2.58 persons. *See, e.g.,* U.S. Census, HOUSEHOLDS AND FAMILIES: 2010 (April 2012) (available at: https://www.census.gov/prod/cen2010/briefs/c2010br-14.pdf).

[47]   E. Badger, *Why Are There No Big Cities with Municipal Broadband Networks*, THE ATLANTIC: CITYLAB (March 4, 2013) (available at: http://www.citylab.com/cityfixer/2013/03/why-are-there-no-big-cities-municipal-broadband-networks/4857).

Figure 2. Municipal Broadband Systems and Population

Private providers offer service in many (if not nearly all) of the cities included in Figure 2, but they may not offer service ubiquitously or at quality level deemed adequate by city officials. While there are targeted federal subsidies for unprofitable areas where no service exists, federal policymakers have largely ignored these areas where private incentives may not be sufficient for network upgrades (at least on the city's preferred schedule) where private networks already exist. There is no federal policy for these "marginal" communities that lie between the clearly unserved and the clearly served. For the most part, these cities have been left on their own, being encouraged by the federal government to take on risky and controversial investments to meet what they believe are their needs for communications infrastructure. If cities are to take on that responsibility, it is essential that we understand the nature and consequences of municipal entry. I turn to that issue later in the text.

D. *Economic Development and Municipal Broadband*

Perhaps the most common argument used in favor of municipal systems is economic development. A number of studies allegedly provide evidence that advanced communications networks "cause" economic growth, and these studies are often cited in support of municipal broadband.[48] Case studies are also used to support the argument.

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[48] There are many studies—of varying quality—on the relationship between broadband and economic growth. *See, e.g., Impact of Broadband on the Economy*, 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); *Socioeconomic Effects of Broadband Speed*, Ericsson, Arthur D. Little and Chalmers University of Technology (September 2013) (available at: http://www.ericsson.com/res/thecompany/docs/corporate-responsibility/2013/ericsson-broadband-final-071013.pdf); M. Minges, *Exploring the Relationship Between Broadband and Economic Growth*, WORLDBANK: WORLD DEVELOPMENT REPORT 2016 (January 2015) (available at:

However, the economic development motivation is defective. Broadband is, no doubt, important economic infrastructure, but it is no magic pill. In the context of municipal broadband, economic development is a local, not a global, phenomenon.

Most of the gains attributed to municipal broadband systems are based on *economic migration* rather than *economic development*. Consider, for example, FCC Chairman Tom Wheeler's description of the economic gains attributed to the municipal network in Chattanooga-Tennessee: "Smaller businesses such as Claris Networks, Co.Lab, EDOps, and Lamp Post Group *relocated* to the city, and Chattanooga is also emerging as an incubator for tech start-ups."[49] Note the operative word here is "relocated." For the most part, the economic development from municipal broadband systems appears to be based on stealing businesses from other cities. Certainly, such "economic migration"—as opposed to economic growth—is advantageous to a city, but whatever gains the city obtains from recruiting business is a loss to the city from which that business came. Since there are costs to moving and large costs of building the network (usually prematurely from a economic viewpoint), it may be that the migration is net detrimental to society as a whole.[50] Most troubling is that the federal subsidies used to support financially municipal networks are funded through federal taxation; therefore, the people in cities losing businesses are perversely funding the broadband networks that are destroying their economy. While it is easy to see a city's leadership wanting to advantage its city over others, it is not clear why federal and state governments should be complicit in the act.

Also, economic migration—i.e., business *stealing*—is not a sustainable policy. Chattanooga and other cities were perhaps wise to get a first-mover advantage in stealing businesses from other cities, but as the deployment of fiber networks becomes more pervasive the first- or early-mover advantages of cities with municipal broadband networks is diminished. A "first mover" advantage is, by definition, not available to late comers. Newer and proposed deployments of municipal systems are perhaps already late to the party; the incentive to migrate to a particular city for high-speed broadband, and the economic gain realized from such migration, gets smaller by the day. Now, and in the future, broadband availability will focus more on saving existing rather than stealing new businesses.

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http://pubdocs.worldbank.org/pubdocs/publicdoc/2016/1/391452529895999/WDR16-BP-Exploring-the-Relationship-between-Broadband-and-Economic-Growth-Minges.pdf); R. Crandall, W. Lehr, and R. Litan, *The Effects of Broadband Deployment on Output and Employment: A Cross-sectional Analysis of U.S. Data*, BROOKINGS INSTITUTION, ISSUES IN ECONOMIC POLICY (June 2007) (available at: http://www.brookings.edu/research/papers/2007/06/labor-crandall).

[49] T. Wheeler, *Removing Barriers to Competitive Community Broadband,* OFFICIAL FCC BLOG (June 10, 2014) (emphasis supplied) (available at: http://www.fcc.gov/blog/removing-barriers-competitive-community-broadband).

[50] While there may be some global economic gain from fiber deployment, much of the benefits used to support municipal broadband deployments are from economic migration rather than from overall economic growth. Whatever the global gains may be, they must be sufficient to offset the sizeable costs of the municipal broadband strategy.

The discussion of externality—that is, some activity that causes a difference between private and social valuations—is also relevant to the economic development issue. Cities building municipal networks justify doing so because those networks permit them to steal businesses from other cities. The cities view such economic gains as "social" in nature—and they may be social within the city limits—but in fact they are mostly private. Society includes both the city doing the stealing and its victims. Taking a city to be a collective of private (and political) interests, economic theory would suggest an inefficiency driven by the private motivations of a city's leadership. This *economic war among the cities* supports a role for state and federal governance over municipal broadband, since the private and individual decisions of cities may not coincide with broader social goals.[51] Unfortunately, the states and the federal government are at loggerheads over municipal broadband, but of the two, my analysis suggests the state legislatures are arguably on firmer economic footing.

IV. Municipal Broadband, Competition and Welfare

A professor of economics stands before her class of fifty students with $101 in her hand. She offers an even cut of that $101 to every student willing to pay $20 to enter into the sharing scheme. At first, most of the fifty raise their hands to participate for an easy profit, but since a share is worth only about $2 if split among all fifty students, hands soon begin to fall. How many hands are up in the end? If six, then each participant gets only $16.80, which is less than the $20 entry fee. So the final number must be less than six. If four, then each participant gets $25.25, earning a $5.25 profit on the $20 investment. While a good deal, the sum of these profits equals $21 (= 5.25 × 4), so there is room for one more participant to make a profit at the $20 entry fee. In the end, there are five participants, with each student earning a return of $0.20 on their $20 investment. There is no motivation for a sixth student to enter, and no motivation for one of the five final participants to exit. Five participants is an *equilibrium*.[52]

The simplicity of this game belies a significant economic insight. If a firm believes it can enter and serve a market profitably, then it will enter. If an existing firm is losing money and sees no way to turn that around, then it will exit. When entry and exit stop (or balance), the market is said to have reached equilibrium. Just like prices and quantities have equilibrium levels, there exist an *equilibrium number of firms* that arises naturally out of the economic conditions of the marketplace. Whether this equilibrium industry structure is satisfactory to particular parties or policymakers is beside the point; the supply-side and demand-side conditions determine the number of firms that can profitably serve the market. That number may be big or small. If market conditions only

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51   *See, e.g.,* A.J. Rolnick and M.L. Burstein, *Congress Should End the Economic War Among the States*, ANNUAL REPORT: FEDERAL RESERVE BANK OF MINNEAPOLIS (January 1, 1995) (available at: https://minneapolisfed.org/publications/annual-reports/congress-should-end-the-economic-war-among-the-states).

52   For purposes of exposition, the discussion of this example is simplified somewhat. In particular, we ignore the possibility of equilibria in mixed strategies. One consequence of such solutions is that the observed number of entrants will be random, although the point being stressed in the text remains correct.

permit two firms to operate profitably, then three firms cannot do so, and no amount of wishful thinking or complaining will change that fact.

As discussed above, the case for aggressive competition policy in broadband markets is based on data showing that most households have few options (if any options at all). While two or three providers is unarguably few, this fewness is not an accident. It is driven primarily by the supply- and demand-side conditions for the services offered over wireline communications networks. As the FCC recognized in its *National Broadband Plan*:

> Building broadband networks—especially wireline—requires large fixed and sunk investments. Consequently, the industry will probably always have a relatively small number of facilities-based competitors, at least for wireline service.[53]

Because wireline communications networks are exceedingly expensive to build, maintain, and operate, "fewness" is to be expected. The more there are of them, the less market share is available to any single firm, making it very difficult to earn a return sufficient justify the investments. While the "relatively small number of facilities-based competitors" is often lamented by advocates and policy makers, it is, in many respects, Mother Nature that has produced that outcome. Certainly, there may be policies that make entry more difficult (e.g., local franchise laws, Net Neutrality) and there may be policies that ease entry (i.e., tax incentives, easy rights-of-way rules, and so forth). Even so, the nature of providing wireline services prohibits large numbers of firms and there's little public policy can do to alter those underlying economic forces with the possible exception of massive and sustained subsidization (which presents its own set of issues).

As for me, an economist studying communications policy for the past twenty-five years, I think a little perspective is in order. Let's not forget that not that long ago there was essentially no competition for communications and video services and households were faced with buying from regulated monopolists, if they were regulated at all. In the mid to late-1990s, even the thought of having two wireline providers of voice and video service was a cause for celebration. It was understood, both practically and theoretically, that even a little competition goes a long way. In fact, the U.S. Congress codified that idea. In the Cable Competition and Consumer Protection Act of 1992, for example, Congress imposed rate regulation on cable television systems. Rate controls were eliminated, however, if a cable system faced *half a competitor* (i.e., a rival that passed half the homes in a franchise area).[54] Congress determined that half a competitor is better than a regulated monopolist, and the evidence has affirmed this view.[55] Interestingly, the rate reductions imposed on cable systems after the 1992 Cable Act were based on a statistical study of rate reductions found in markets with *two* competitors. Rate regulation, at its best, could only mimic the duopoly outcome. Two competitors in wireline broadband was taken to be very good stuff, and two wireline providers may be the best you can do in many cities and rural areas (without a substantial subsidization of broadband services). If the

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[53]   *National Broadband Plan*, *supra* n. 2 at p. 36.

[54]   1992 Cable Act, Section 623(l); 47 U.S.C. § 542(l).

[55]   T. Hazlett and M. Spitzer, Public Policy Toward Cable Television: The Economics of Rate Controls (1997).

full costs of the subsidies are considered in a cost-benefit analysis, then there is no guarantee such subsidies will increase consumer welfare.

Also, it is important to keep in mind that the "number of competitors" is not the equivalent of "competition." Consider a market where there are two firms. These two firms may compete very aggressively or not at all (i.e., collusion). Either is a possibility. The number of competitors alone does not say much about the intensity of price competition.[56] In fact, if firms compete intensely, only a few firms can survive, implying that few competitors in a market may be an indicator of intense price competition rather than a lack of it.[57] (In the Professor's game, imagine what would happen if for every hand raised, the prize shrunk by $5. There would fewer students—only four in fact— willing to raise their hand in the end.) A look at the financials of firms that offer wireline services and the lack of widespread competitive entry certainly does not suggest they are earning huge returns. Accounting profits for these firms are below average for firms in the S&P 500.[58]

The fact is that the outcomes we observe in markets, whether we like them or not, are what the inherent supply- and demand-side conditions of the market permit. Changing such outcomes will require costly regulatory interventions, and history suggests such interventions are typically politically-motivated, ham-handed and ineffective at increasing the number of providers for wireline communications services.[59] Policymakers are swimming upstream. Wireline communications is a hard business. Economic theory also indicates that if we exclude the possibility of subsidizing firms—a program which imposes the social costs of taxing some other sector of the economy—then the observed number of firms from a free entry scenario, even if that number is small, is equivalent to the number of firms chosen by a capable regulator intent on maximizing the benefits to the consumer and providing firms just enough profit to keep them in the business and in no need of subsidies. Of course, in the presence of such a benevolent, wise and all powerful social planner, perhaps there's no need for competition in the first place since the competitive outcome could be produced by the planner's mandate. Yet, experience suggests that the performance in even workably competitive markets dominates either regulated monopoly or industry nationalization. Almost all advanced economies have abandoned nationalized communications networks and have done so for good reason.

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[56] *See* G.S. Ford, T.M. Koutsky and L.J. Spiwak, *Competition After Unbundling: Entry, Industry Structure and Convergence*, 59 FEDERAL COMMUNICATIONS LAW JOURNAL 331 (2007) (available at: http://www.phoenix-center.org/papers/FCLJCompetitionAfterUnbundling.pdf) for a detailed discussion.

[57] *Id.*

[58] G.S. Ford and L.J. Spiwak, *Substantial Profits in the Broadband Ecosystem: A Look at the Evidence*, PHOENIX CENTER PERSPECTIVE No 10-04 (April 22, 2010) (available at: http://www.phoenix-center.org/perspectives/Perspective10-04Final.pdf).

[59] G.S. Ford and L.J. Spiwak, *Lessons Learned from the U.S. Unbundling Experience*, 68 FEDERAL COMMUNICATIONS LAW JOURNAL 95-138 (2016) (available at: http://www.fclj.org/wp-content/uploads/2016/01/68.1.3-Spiwak-and-Ford.pdf).

A. *The Equilibrium Number of Firms*

We can formalize the analysis with a very basic economic model to get a more precise understanding of the issue. My goal here is to keep it as simple as possible (e.g., a linear model) but rich enough that the key elements of the issue can be addressed. Numerical examples and figures are provided to illustrate the logic of the analysis, which is quite intuitive. This bit of rigor disciplines the argument, and if intellectual discipline is needed anywhere today, it is in communications policy generally and the municipal broadband issue specifically. Nevertheless, the classroom example above illustrates the prescriptions of this more technical analysis.

Consistent with the standard view that more competitors leads to lower prices and firm profits, I employ the Cournot Model of Competition, which results in a smooth movement from monopoly to perfectly competitive prices (and profits) as the number of rivals increases (see Figure 3 below).[60] Also, in policy debates, the number of firms is often taken to measure the degree of competition, and the Cournot Model is consistent with that view. So to begin, consider a Cournot Oligopoly model with N symmetric (or identical) firms and a linear market demand curve given as:

$$P = A - Q, \tag{1}$$

where P is market price, Q is market quantity, and A is the intercept of the market demand curve (which is also a measure of market size). For convenience, we assume that each firm has zero marginal costs and fixed costs equal to f. The firms are symmetric so they all charge the market price and sell quantities Q/N, where N is the number of firms. The Nash Equilibrium is characterized by the following price (P_e):

$$P_e = \frac{A}{N+1}; \tag{2}$$

and total quantity (Q_e):

$$Q_e = \frac{N \cdot A}{N+1}. \tag{3}$$

Equation (2) reveals the familiar result that equilibrium price falls as the number of firms (N) increases. Likewise, Equation (3) shows that total quantity rises in the number of firms (in response to the price decline). Each firm has a quantity of $q_e = Q_e/N$, so each firm's profits are just $P_e q_e$. Figure 3 illustrates the relationship between the number of firms, N, and price (Panel A) and firm profits (Panel B).

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[60] In the Cournot model, rival firms choose the quantity they wish to offer for sale. Each firm maximizes profit on the assumption that the quantity produced by its rivals is not affected by its own output decisions. *See, e.g.,* D.W. Carlton and J.M. Perloff, Modern Industrial Organization (2000), at Ch. 6.

Figure 3. Prices, Profits and the Number of Firms

Panel A: Price   Panel B: Firm Profit
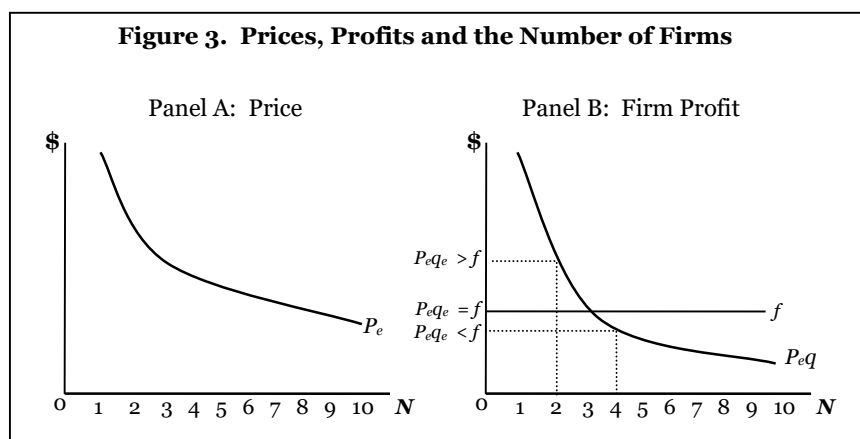
As shown in Panel A of Figure 3, as the number of firms (N) increases, the market price falls. Panel B shows that firm's profits also fall as N increases. Profits fall at a faster rate than prices because not only are total industry profits falling as N rises but also because those lower profits are being split among more firms (a shrinking pie is being cut into more and more pieces). The number of firms is obviously quite important to competition policy, so what determines N? The answer is, *profits do*.

If a firm can enter and earn a profit large enough to pay f, then it will. At some point, however, falling prices from additional entry will lead to prices and quantities so low that f cannot be covered. When that happens, entry stops. Or, if too many firms enter, then all firms lose money, and a firm(s) must exit. When the entry and exit stop (or balance), then the equilibrium number of firms, N^*, is obtained. In Panel B of Figure 3, with fixed cost f, if N were 4, all firms lose money ($P_e q_e < f$). If N is 2, then profits are positive ($P_e q_e > f$) and sufficiently so that a third firm can enter and still make a profit. Thus, the equilibrium number of firms is $N^* = 3$; no firm wants to exit, and no firm wants to enter.

The figure indicates that to determine the long-run equilibrium number of firms, I must first set firm profits equal to zero:

$$P_e q_e - f = 0, \tag{4}$$

and then I solve this condition for the long-run number of firms which is (the integer part of):

$$N^* = \frac{A}{\sqrt{f}} - 1. \tag{5}$$

This equation is very simple but it contains a very basic insight for competition policy.[61] That is, the larger is market size (A) relative to the fixed cost of providing the service (f),

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    [61]   The theory of equilibrium industry structure is well developed and much research has stemmed from the pioneering work of Professor John Sutton. J. Sutton, Sunk Cost and Market Structure (1991). For an explanation of this work, *see* Ford, Koutsky and Spiwak, *Competition After Unbundling, supra* n. 56; *see also*

the larger will be the number of firms in equilibrium. Going back to the example of the Professor's game, if the prize was raised from \$101 to \$201, then 10 students would be willing to pony up the \$20 fee (recall only five did so at a prize of \$101). When the prize (that is, the market) gets bigger, the more students are willing to participate in the game.

The relationships implied by Equation (5) are illustrated in Figure 4. In Panel A, market size (A) is measured along the horizontal and the number of firms along the vertical axis. Two curves are shown with one reflecting high fixed costs (f) and the other low fixed costs. As market size gets larger, so does the number of firms. But, the number of firms grows faster as market size rises when fixed costs are relatively lower. At A', there are N_1 firms when fixed costs are low and N_2 firms when fixed costs are high. In Panel B, fixed costs are measured along the horizontal axis. With market size constant, as fixed costs rise, the number of firms declines (non-linearly, given Eq. 5). The number of firms will be larger for any given f when market size (A) is larger. At f', there are N_1 firms when fixed costs are low and N_2 firms when fixed costs are high.

Figure 4. Market Size, Fixed Costs and the Number of Firms
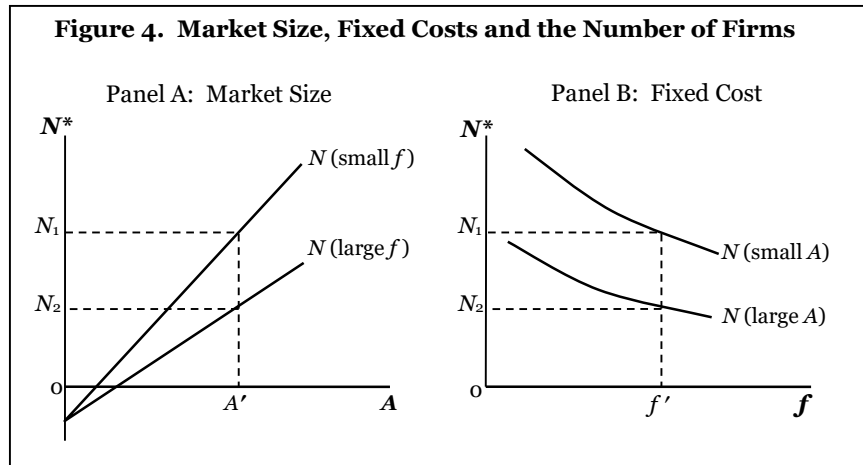
The implications are clear. A large market with low capital costs will have many sellers (A is large, f is small) and a small market with large fixed capital costs will have few sellers (A is small, f is large). Even in a large market, few providers may exist if fixed costs are also large (A is large, f is large too). Large fixed costs create scale and density economies, and these economies favor large firms and thereby limit their numbers. In many cities across the U.S., and in many cities where municipal systems are being built or considered, the markets are small (low population) and the fixed costs relatively high given the low density of that population. Both factors work against a large number of firms (or even the presence of one firm).

Equation (5) indicates that the number of firms in a market is finite and may be determined by factors mostly outside the control of public policy (or exogenous), such as

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In the Matter of Implementation of Section 19 of the Cable Television Consumer Protection and Competition Act of 1992, Annual Assessment of the Status of Competition in the Market for the Delivery of Video Programming, FIRST REPORT, FCC 94-235, 9 FCC Rcd 7442 (rel. September 28, 1994) at Appendix H.

consumer preferences and the costs of building and maintaining a network. The theory further reveals that public policy cannot choose N^* directly.[62] If policymakers are unhappy with the number of providers, then public policy usually must either increase the size of the market or reduce the fixed costs of providing the service. Equation (5) also provides a detailed explanation for the *National Broadband Plan's* statement that "[b]uilding broadband networks—especially wireline—requires large fixed and sunk investments. Consequently, the industry will probably always have a relatively small number of facilities-based competitors, at least for wireline service." In effect, the *Plan's* statement says that if *f* is large, *N* is likely to be small.

There is great practical significance to this theory as well. When someone says "we need to promote competition," the retort is to ask "what are you doing to increase market size or reduce entry costs?" If competition is taken to be the number of firms as it often is, then economics tells us that changing market size or entry costs (or both) is the only real mechanism by which to increase the number of competitors. Municipal broadband does neither but merely ignores the underlying economic factors. It is, consequently, no surprise that many of the municipal systems have experienced profound financial difficulties. While it's possible to construct more sophisticated models that introduce more factors, it's also true in these models that market size and fixed costs are the key determinants to the number of firms. In fact, these additional factors often appear as mere scales of market size or costs. Most policy actions can be collapsed into either market size or fixed costs, and therefore the influence of policy on the number of firms can be readily assessed.[63] More intense price competition and taxes, for example, shrink market size and thus produce equilibriums with fewer firms. Subsidies may reduce fixed cost (or increase market size), thereby increasing the number of competitors in equilibrium, but subsidies are not free and threaten the profitability of firms not receiving them, perhaps causing exist and no change in *N*.

B. *Welfare and the Number of Competitors*

Much of the conversation regarding communications policy generally, and municipal broadband policy specifically, is about promoting competition. Yet, *competition is a*

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[62] It is perhaps more accurate to say that policymakers cannot make *N* exceed N^*. Regulations can always be used to reduce *N* below N^* (i.e., a franchised monopoly), though there will be pressures to eliminate such restrictions if more competition is possible. In the early days of the mobile wireless industry, the FCC allocated licenses in order to maintain a large number of firms. Competition was excessive, and eventually mergers and acquisitions reduced the number of rivals. *See, e.g.,* T.R. Beard, G.S. Ford, L.J. Spiwak and M. Stern, *Wireless Competition Under Spectrum Exhaust*, 65 FEDERAL COMMUNICATIONS LAW JOURNAL 79 (2012) (available at: http://www.phoenix-center.org/FCLJSpectrumExhaust.pdf). In the radio industry, the FCC also limited the number of stations a single owner could own, but inefficiencies eventually led to the relaxation of those ownership rules. *See, e.g.,* R.B. Ekelund Jr., G.S. Ford, and T. Koutsky, *Market Power in Radio Markets: An Empirical Analysis of Local and National Concentration*, 43 JOURNAL OF LAW AND ECONOMICS 157-184 (2000).

[63] *Competition After Unbundling*, *supra* n. 56 at Section IV; T.R. Beard, G.S. Ford, T.M. Koutsky, and L.J. Spiwak, *Network Neutrality and Industry Structure*, 29 HASTINGS COMMUNICATIONS & ENTERTAINMENT LAW JOURNAL 149-170 (2007) (available at: http://www.phoenix-center.org/papers/CommEntNetworkNeutrality.pdf).

means, not an end. Competition isn't valued because it lowers prices. In fact, prices can be too low. Competition is valued because it increases consumer welfare by bringing prices in line with costs and ensuring that what consumers really want and are willing to pay for gets produced.[64] What's advantageous about competition is that it forces firms to weigh both consumer interests as well as the costs of production, thereby increasing consumer welfare by an invisible hand.

If competition works via an *invisible* hand, we must at least question the wisdom of introducing the *visible* hand of policy. Should policymakers promote competition in wireline markets at any costs? Of course not. To see why, let's analyze the effect of the number of firms on consumer welfare (labeled *W*), where consumer welfare is the sum of benefits to consumers and firms less the cost of producing those benefits. Consumer welfare is the standard by which policy is typically judged, at least by economists.[65]

Let's look at consumer welfare more formally to see the point. As a function of the number of firms, the welfare function is:

$$W(N) = \tfrac{1}{2}(A^2 - P_e^{\,2}) - Nf \;. \tag{6}$$

The first term of Equation (6) is the benefits to consumers and producers. The second term is the costs of making the good or service available, which is just the number of firms in the market multiplied by their fixed costs (recall, marginal costs are assumed to be zero for convenience).

What happens to welfare if we increase the number of firms? We can figure that out by taking the derivative of the consumer welfare function with respect to the number of firms (*N*), rendering:

$$W'(N) = \frac{P_e^2}{N+1} - f \;. \tag{7}$$

From Equation (7), we can clearly see the two contrary effects of additional entry. The first term of Equation (7) shows that adding an additional firm to the market adds to consumer welfare by reducing the equilibrium price. Consumers favor more firms, since they benefit privately from lower prices. Note that this positive effect will be smaller the larger is the number of firms (see Figure 3), since adding a third firm has a much larger effect than, say, adding a tenth. The second term of Equation (7) implies that adding another firm reduces consumer welfare by replicating fixed cost *f*, which is a constant. Equation (7) reveals the tradeoff from additional entry—lower prices versus higher fixed costs. In effect, a price reduction from an increase in the number of firms must be

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purchased and the price paid for the lower price is the fixed cost *f*. For welfare to rise, the benefits of the price cut must exceed the additional fixed cost. This point is important—*price cuts from additional competitors must be purchased, and in broadband markets, they are purchased at the very high cost of building an additional network*. Society desires (from a welfare perspective) not to pay too dearly for a price cut, so looking to competition to drive price reductions may not be the wisest policy.

Consider a hypothetical where 80 million broadband consumers could organize costlessly to build their own fiber network to serve every customer. This company must be financially sustainable without subsidies, which is, of course, a stretch since if it was possible to enter profitably, a private firm already would have done so. For argument's sake, let's set aside this logical nuisance for the moment. Suppose the business model suggests that this new firm would, through competition, reduce the price by 10%. Even so, the network is calculated to remain financially viable. The average price before entry is $80 so the discount is $8 per month, reducing the price to $72 per month, and producing an annual savings of $96 per subscriber. Total payoffs from the discount are measured as the net present value of the savings over 15 years discounted at a rate of 5%, which is approximately equal to ten-times the annual effect of the discount. So, the payoff per customer of the network is $960, with total network benefits of about $77 billion across the 80 million subscribers. These benefits must be compared to the cost of producing them. Very conservative estimates of the cost of a nationwide Google-style fiber network are $140 billion (closer to $300 billion over the fifteen-year window if you assume a 10% maintenance and upgrade factor), but the benefits to consumers are only $77 billion.[66] Consumers, at least rational ones, would not wish to construct such a network (the costs exceed the benefits by a long shot).

Alternately, assume that a social planner is considering building such a network.[67] Unlike the consumers, the social planner also considers the effect of the price discount on sellers; after all, sellers are just consumers engaged in a supply-side role. Thus, the $77 billion of benefits from the discount calculated above are merely a transfer from sellers to consumers, which to the social planner are a wash. Only the gains to new consumers are of any value to the social planner. Assuming that a 10% discount would lead to a 10% increase in adoption, the total welfare effects of the new network are only $3.8 million.[68] At a cost of no less than $140 billion, it's clear that the social planner would not construct the network, absent an unreasonable assumption about the size of the externality.

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[66]   J. Yarow, *How Much It Would Cost Google To Become A National Cable Company Like Comcast*, BUSINESS INSIDER (December 7, 2012) (available at: http://www.businessinsider.com/how-much-it-would-cost-google-to-build-a-cable-network-2012-12). The estimates are based on actual spends, but those figures come from more densely populated areas and do not account for the exceedingly high cost of rural buildouts. The FCC estimates a nationwide buildout would cost $350 billion. *See Broadband Plan Presentation*, *September Commission Meeting*, Federal Communications Commission (September 29, 2009) at Slide 45 (available at: https://apps.fcc.gov/edocs_public/attachmatch/DOC-293742A1.pdf).

[67]   By "social planner", I mean an entity that maximizes social welfare, which is equal to the benefits to both buyers and sellers.

[68]   It is assumed the new customers are responding only to the price cut and not availability.

C. *Adding Competitors to a Market Already in Equilibrium*

In many policy-relevant contexts, there is frustration with the number of competitors that Mother Nature has produced in broadband markets (that is, N^*). In those cases, it's not the general welfare tradeoffs that are of interest, but rather the welfare consequences arising from the addition of a competitor to a market already in a private-entry equilibrium (see Eq. 5). Thus, we need to evaluate the welfare function at the equilibrium levels of N^* and P_e^*. By substitution, this yields the long-run market price:

$$P_e^* = \sqrt{f} \ . \tag{8}$$

Evaluating the derivative of the welfare function of Equation (6) at the long-run number of firms (and price), we have:

$$W'(N^*) = -\frac{fN^*}{N^*+1} < 0 \ . \tag{9}$$

Equation (9) indicates that the derivative of the welfare function with respect to the number of firms is negative *at the long-run equilibrium level of private sector firms.* That is, the entry of an equally efficient firm to a market in equilibrium would cause a decrease in consumer welfare. Promoting "more firms" for the sake of competition is not in all circumstances a good thing. Certainly, policies that remove government activities that shrink market size or raise fixed costs are valid targets for reform, but forcing N to be larger for the sake of a larger N, even accounting for any associated price reduction, may be bad policy.

Figure 5 illustrates the relationship between consumer welfare and the number of firms under three scenarios—near zero fixed costs (W_0), low fixed costs (W_L) and high fixed costs (W_H). To generate the curves in the figure, I assume A is 36 and f is 0.1 (essentially zero fixed cost), 50 (low fixed cost) or 144 (high fixed cost) and then compute Equation (6) accordingly.[69] With essentially no fixed costs, N is just over 100 firms, so that welfare rises as the number of firms increases across the range shown in Figure 5.[70] In the low fixed cost case, N^* is 4 by Equation (5); in the high fixed cost case, N^* is 2. With fixed costs, however, the addition of firms to the market does not always increase welfare. In both cases where fixed costs are larger, the figure reveals that consumer welfare is declining at the equilibrium number of firms and continues to decline for even larger N; more entry is not always better; entry is costly. In fact, with free entry and fixed costs, most models of competition indicate that entry is excessive on welfare grounds.[71] Certainly, entry in excess of the private-entry equilibrium seems likely to reduce consumer

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[69] The term N^* is undefined at $f = 0$, so I have selected an arbitrarily small value for f.

[70] The change in welfare from additional will be negative at the equilibrium number of firms (about 112).

[71] *See, e.g.,* N.G. Mankiw and M.D. Whinston, *Free Entry and Social Inefficiency*, 17 RAND JOURNAL OF ECONOMICS 48-58 (1986); A.K. Dixit and J.E. Stiglitz, *Monopolistic Competition and Optimal Product Diversity*, 67 AMERICAN ECONOMIC REVIEW 297-308 (1977); S. Salop, *Monopolistic Competition with Outside Goods*, 10 BELL JOURNAL OF ECONOMICS 141-156 (1979).

welfare. Communications policy is more nuanced than a simple "promote competition" agenda suggests.

Figure 5. Social welfare and *N*
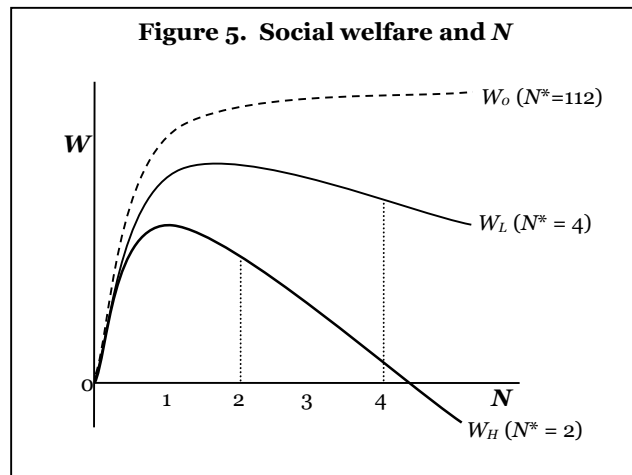
More sophisticated models of competition may render different relationships between consumer welfare and the number of providers, but even so it is typical for economic models to show that free entry results in too many firms in equilibrium. The reason is that a firm only considers its own profits when it contemplates entry, and when it does enter it steals business from existing firms. The movement of profits between firms does not increase welfare, but does increase profits to the entrant; it is only the increase in welfare that counts against the fixed cost of entry. From a welfare perspective, the incentive to enter is *too strong*.

This analysis might lead one to conclude that governments should limit entry, but that is not the case. In practice, *free entry* should be encouraged for many reasons, including primarily that there is no reason to suspect that policymakers have the capacity to produce a better outcome.[72] Also, the free entry number of firms is equal to the number of firms chosen by a social planner that maximizes consumer surplus (by choosing *N* rather than *P*) subject to a zero-profit constraint (i.e., no subsidies).[73] Also, in most cases, firms offer differentiated products and services, and differentiation adds value for consumers that will at least partially the fixed cost of entry. (Though entry is often excessive even in models with product differentiation.)[74]

Rather than an indictment against free entry, the welfare result encourages caution in implementing policies designed to *force entry* into markets already in equilibrium. As

[72] Prior to the *Telecommunications Act of 1996*, regulations prohibited entry in many telecommunications markets based on the belief that such markets were natural monopolies. The U.S. abandoned that approach, though the rules of the FCC's new CAF only subsidized one firm, which is a policy based (rightfully) on the natural monopoly logic.

[73] Dixit and Stiglitz, *supra* n. 71 at p. 301 ("… we have a rather surprising case where the monopolistic competition equilibrium is identical with the optimum constrained by the lack of lump sum subsidies.")

[74] There exists a substantial literature on this topic, much of it pointing back to the seminal paper: S.C. Salop, *Monopolistic Competition with Outside Goods*, 10 BELL JOURNAL OF ECONOMICS 141-156 (1979).

shown in Figure 5, caution is particularly warranted in markets where N^* is small, as in wireline broadband service, since the reductions in welfare from excessive entry are relatively large (because fixed costs are large). If public policy is to encourage entry, then it should focus on growing market size and reducing entry costs, looking first at government policies that impede or retard competitive entry. Making markets more suitable for competition is a sensible goal, but forcing competition beyond what markets produce is not likely to be welfare improving. As I will discuss later, the presence of an externality alters the welfare calculations, but not by much with respect to N.

D. *The Value of the First Firm*

Figure 5 also shows the importance of the first entrant. In almost all cases, adding the first firm to the market produces much of the welfare available from the product. The first firm is very, very important. In communities without broadband service, getting that first provider into the market is exceedingly crucial, especially in light of the view that broadband is privately and socially valuable. Enticing the first firm in the market is valuable, but it should still be subject to a cost-benefit analysis. The *National Broadband Plan*, for example, estimated that for the six million most costly homes to provide service (and even then the most efficient technology), the average cost to provider service was in excess of $50,000 per home passed.[75] There is no business case, whether private or social, for such expenditures. The returns to broadband, whether private or social, are not infinitely large.

In contrast, additional firms, while perhaps transferring some welfare from producers to consumers, is not all that helpful in increasing consumer welfare when fixed costs are large. I do not wish to belittle the value of competition, as it often brings with it benefits that are not easily incorporated into economic models. Economic theory, for example, is ambiguous about the effects of competition on quality and costs.[76] Yet, experience suggests that in many cases quality is higher with competition (but not always). While monopoly takes a lot of criticism, the fact is that in markets with high fixed costs, a monopoly may deliver the bulk of the available benefits of the service, even if it behaves like a monopolist (see Figure 5).

E. *Externalities and the Equilibrium Number of Competitors*

Broadband Internet service is not an unqualified good, but its benefits are alleged to be many, like enabling health care, improving education, facilitating job search, reducing

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[75] *See, e.g.,* G.S. Ford and L.J. Spiwak, *Justifying the Ends: Section 706 and the Regulation of Broadband*, 16 JOURNAL OF INTERNET LAW 1 (January 2013) (available at: http://www.phoenix-center.org/papers/JournalofInternetLawSection706.pdf).

[76] *See*, *e.g.*, R.E. Kranton, *Competition and the Incentive to Produce High Quality*, 70 ECONOMICA 385-404 (2003); J. Tirole, THE THEORY OF INDUSTRIAL STRUCTURE (1988); Y. Chen and M. Schwartz, *Product Innovation Incentives: Monopoly vs. Competition*, 22 JOURNAL OF ECONOMICS & MANAGEMENT STRATEGY 513-528 (2013).

depression, and creating "today's high-performance America."[77] Given the large benefits of both a private and (alleged) social nature, attention is focused on expanding the adoption of broadband service. Adoption isn't possible without availability, so expanding availability is one goal of public policy. But as the *National Broadband Plan* makes clear, availability is a means to an end, and that end is adoption and use.[78] Using the Internet is what's important; without *use* the benefits aren't obtained.

Later in the paper, I'll analyze the relevance of the positive externalities in more detail, with particular attention on municipal broadband. For now, let's just see how we can incorporate a positive externality into the model presented above. The easiest way to think about positive externalities is as an additional payoff to consumption. Let *z* be the value of the positive externalities ($z > 0$) per unit consumed (Q_e). The total value of the positive externalities is, then, just zQ_e. More formally, I can incorporate broadband's externality into the analysis by adding a term to the consumer welfare function of Equation (6):

$$W(N) = \tfrac{1}{2}(A^2 - P_e^{\,2}) - Nf + zQ_e, \tag{10}$$

Equation (10) says that the more people that use broadband, the greater is the payoff to society from the positive externalities. With the externality, society is better off with more *Q* than the private equilibrium would produce.

In Figure 6, the relationship between consumer welfare and the number of firms is illustrated for the purposes of seeing the value of the externality. The curve labeled *W* is based on Equation (6) where *A* is 36 and *f* is 144 (the high-fixed cost case from Figure 3). The curve labeled W_{zQ} is the welfare function from Equation (10) that adds in the value of the externality, where *z* is assumed to be 2 (about 10% of the welfare-maximizing price from Eq. 6). As shown in the figure, welfare is much higher when adding in the externality, but the welfare consequences of additional entry at the equilibrium ($N^* = 2$ is the standard case) are unchanged (welfare is declining at N^*).

[77]   *See, generally, National Broadband Plan, supra* n. 2; T.R. Beard, G.S. Ford and T. Koutsky, *Broadband and Economic Development: A Municipal Case Study from Florida*, 17 REVIEW OF URBAN & REGIONAL DEVELOPMENT STUDIES 219-229 (2005); G.S. Ford, R.P. Saba, and R.A. Seals, *Internet Use and Job Search*, 36 TELECOMMUNICATIONS POLICY 260–273 (2012); S.R. Cotton, G. Ford, S. Ford, and T.M. Hale, *Internet Use and Depression Among Older Adults*, 28 COMPUTERS IN HUMAN BEHAVIOR 496-499 (2012); S.R. Cotton, G. Ford, S. Ford, and T.M. Hale, *Internet Use and Depression Among Retired Older Adults in the United States: A Longitudinal Analysis*, 69 JOURNALS OF GERONTOLOGY – SERIES B 763-771 (2014) (available at:
http://psychsocgerontology.oxfordjournals.org/content/early/2014/03/25/geronb.gbu018.full.pdf+html).

[78]   *National Broadband Plan, supra* n. 2 at p. 3 ("ubiquitous connections are means, not ends. It is what those connections enable that matters").

Figure 6. Externality, Social welfare and *N*
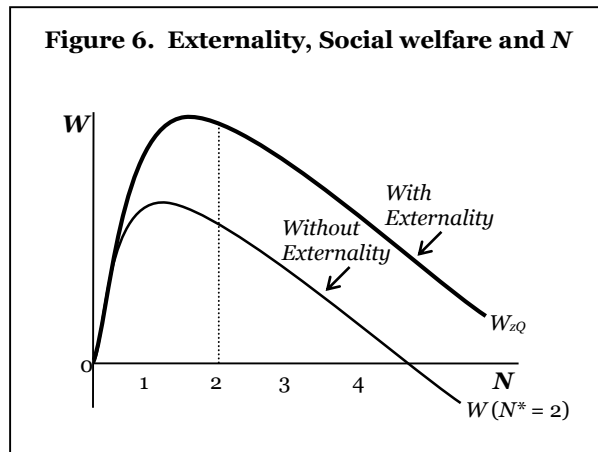
In the presence of a positive externality, there's a strong case for increasing adoption, but no apparent case for expanding *N* above the *N** determined absent the externality. The question then is how to get more people to adopt broadband? There are numerous approaches to increase adoption, including increasing availability, education programs, subsidy programs, and competition. Municipal broadband is often claimed to be a source of competition that drives up *Q* and thus increases the benefits from the positive externalities, but increasing competition comes at the high of network construction. I'll turn to the efficacy of municipal broadband and competition as a means by which to obtain the externalities of broadband next.

V. Subsidies, Predation and Private Investment

It is now time to turn more directly to the issue of municipal broadband. My analysis focuses mainly on using municipal broadband to increase competition and, in turn, realize more positive externalities. Where there is no service, municipal broadband is less controversial, so there is less reason to study it in those cases. The analysis above is capable of evaluating municipal broadband in unserved markets, but my discussion will focus mainly on the competitive aspects of the policy.

Whether one is for or against municipal broadband, at first glance one must admit that it is a somewhat radical, or at least unconventional, way to promote competition. In fact, I suspect most city officials see it that way.[79] I doubt there are many city officials wanting to add to their responsibilities the enormous business risk of building a broadband network to compete in the wireline market with well-established professionals like AT&T, Verizon, and Comcast. Municipal broadband appears to be mostly born out of desperation.

To begin, I'll ask whether or not municipal broadband can increase competition. It is fairly easy to demonstrate that it cannot. In fact, if you take the advocates at their word,

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[79]   T. Sloan, *Why States Should Support Broadband,* BROADBAND COMMUNITIES (May/June 2015) at p. 76 (available at: http://www.bbcmag.com/2015mags/May_June/BBC_May15_WhyStates.pdf).

municipal broadband may lead to the monopolization of wireline broadband either by the city or a private provider. Next, I will demonstrate that municipal broadband must be, in almost all cases, subsidized entry. The evidence supports this finding and few contest it.[80] Then, by implication, I will show that municipal broadband is prone to be predatory in nature. In fact, I will show that even the threat of municipal entry may discourage private sector investment, a theoretical argument that supports the *National Broadband Plan*'s warning about municipal entry.

A. *Municipal Broadband and the Number of Firms*

Recall the key question asked above: *why is the municipality the only one willing to build the network*? And, recall the frequently provided answer: "*because no one else will.*" If no one else will, then it must be the case that the equilibrium number of firms has been obtained (see discussion around Eq. 5), even if that number is zero. There is no incentive for any other private firm to enter (or upgrade). Since no private firm will enter because expected profits are negative, the municipality itself becomes the entrant (ignoring, as is frequently claimed, profits). As such, municipal broadband is, quite explicitly, an attempt to increase N by increasing N directly (at nearly any cost) rather than expand market size or reduce costs. Whether or not the additional entrant is a government-owned firm or not, after entry the market now has $N^* + 1$ firms in it. This situation is financially unsustainable and, when the dust settles, a firm must exit in order for the market to return to the equilibrium. As noted in the *National Broadband Plan,* "[m]unicipal broadband has risks. Municipally financed service may discourage investment by private companies."[81]

How exactly the market will adjust to municipal entry will vary. The economic model presented here is an abstraction pointing to a long-run phenomenon—an underlying current, so to speak, pushing the market participants in a particular direction. Changes will likely come slowly. Broadband networks involve sunk costs in long-term assets and often somewhat stable customer relationships, so we should not expect private firms to abandon their assets soon after municipal entry. Rather, the effects of municipal entry on private investment will manifest over time, and will most acutely impact the decisions to invest in upgrades. "Decay" may be a more practical description of the response than is

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[80] C. Troulos, *Driving Deployment Of Fiber to the Home* , BROADBAND COMMUNITIES (September, 2012) (available at: http://www.bbpmag.com/Features/0912feature-diffraction.php) ("Public endeavors can be supported by public funds [] or by public or semipublic businesses such as electric and water utilities."); J. Hovis, *The Business Case for Government Fiber Networks*, BROADBAND COMMUNITIES (March/April 2013) (available at: http://www.bbpmag.com/2013mags/mar-apr/BBC_Mar13_BusCase.pdf); D. Dawson, *Creative Financing for Fiber Networks*, BROADBAND COMMUNITIES (September 2014) (available at: http://www.bbcmag.com/2014mags/Aug_Sep/BBC_Aug14_CreativeFinancing.pdf); C. Settles, *Show Me the Money*, BROADBAND COMMUNITIES (September 2015) (available at: http://www.bbcmag.com/2015mags/Aug_Sep/BBC_Aug15_ShowMeTheMoney.pdf); *The Next Generation Network Connectivity Handbook, supra* n. 33*,* at 47-51; *Oregon Municipal Broadband*, *supra* n. 31, at 17-18 (available at: http://www.orcities.org/Portals/17/Headlines/BroadbandReport%20July%202011%20FINALforWEB.pdf).

[81] *National Broadband Plan*, *supra* n. 2 at p. 153.

"exit." There have, however, been a few cases where the private sector abandoned a market after municipal entry.

Also, given the observed failures of many municipal systems, incumbents may, in the short term, choose to weather the storm and wait for the municipal entrant to fail, for the political winds to change, or for the taxpayers to tire of subsidizing a communications network (a common occurrence). It is also a competition; incumbents may invest in upgrades in hopes of being a survivor or to establish a strategic posture.[82] We may very well see prices fall in the short run to protect market share, but this is less a legitimate competitive response than it is the same response we would see to predation by a private firm (and we do not view predation as a good thing). Only time will tell how the market gropes to equilibrium, but economic theory (if not common sense) tells us that the addition of another entrant to a market already in equilibrium puts stress on the finances of the providers, reducing the returns on investments and, in turn, reducing the incentive to continue making investments. Quite simply, if there is only room for two, then three is a crowd.

While I normally expect the full equilibrium effect of municipal entry to take time, there are cases where exit by the private sector has occurred in a more dramatic fashion. The municipal broadband system in Glasgow-Kentucky (Glagow Electric Power Board) acquired Comcast's cable system in 2001.[83] Paragould Light Water & Cable (in Paragould-Arkansas) acquired its rival Cablevision in 1998.[84] Private incumbents were also acquired in other cities including, but not limited to, Muscatine-Iowa and Poplar Bluff-Missouri.[85] I do not disparage the purchase of the incumbents by the municipality; it's a far more reasonable strategy than to force their exit through predatory actions (as discussed later). In fact, there is a sound legal and economic basis for requiring municipalities to purchase incumbent systems as a condition for municipal entry, though that analysis is beyond the scope of this paper.[86]

The risk to private sector firms is increased if, as advocates and municipal providers often claim, the municipal system is unconcerned about profits and is mostly interested in obtaining the positive externalities of broadband service. As observed by one system's management (and echoed by many others), "[w]e price our services aggressively because

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[82] *See, e.g.,* D. Fudenberg and J. Tirole, *The Fat-Cat Effect, the Puppy-Dog Poly, and the Lean and Hungry Look*, 74 AMERICAN ECONOMIC REVIEW 361-366 (1984).

[83] Press Release: *Purchase of Comcast by Glasgow EPB Now Complete* (April 2, 2001) (available at: http://www.glasgow-ky.com/releases/#Comcast%20Purchase%20Completed%20040201 .

[84] G. Waldon, *Cable TV War is Over*, ARKANSAS BUSINESS (December 15, 1997)(available at: http://www.arkansasbusiness.com/article/72284/cable-tv-war-over).

[85] *Muscatine to Buy Cable Company's Assets*, PUBLIC POWER DAILY, American Public Power Association (December 3, 2001) (available at: https://www.publicpower.org/Media/daily/ArticleDetail.cfm?ItemNumber=6809); *Rural Broadband Investments Acquires Poplar Bluff Cable Assets*, BUSINESSWIRE (April 1, 2014) (available at: http://www.businesswire.com/news/home/20140401005585/en/Rural-Broadband-Investments-Acquires-Poplar-Bluff-Cable#.VfbQfhHBzRY); *see also Wi-Fi Waste, supra* n. 13 at p. 19.

[86] Some municipalities have acquired investor-owned electric utilities rather than overbuild them.

we have a lot of flexibility as a municipal broadband provider. We are here to take care of our citizens."[87] If a municipal broadband system prices aggressively, which the advocacy suggests is the case, then the effect of municipal entry will be to reduce N^* by more than the entry of just another profit-maximizing private firm.[88] Broadband networks are characterized by both scale and density economies, so a large market share confers advantages. If a municipal entrant gains significant market share and prices at its (perceived) average cost, which is actually below true economic costs due to the often sizable and asymmetric subsidies, then no unsubsidized private firm can match that price and survive in the long run. Since municipal entry often occurs where there are few wireline broadband providers (and thus large density economies), an aggressive municipal entrant could displace all private provision of broadband service.[89] Doing so would lead to a government-owned monopoly (or a private one, if the municipal system fails). In light of the advocacy for municipal broadband networks, which frequently asserts that municipal systems are unconcerned with profit and act more aggressively on pricing than do private firms, monopolization is a serious concern. In fact, some advocates of municipal broadband suggest monopolization is the goal.[90] If there are to be few providers, the argument is that the market might as well be served by a benevolent, government monopolist.

History is not kind to the benevolent monopolist idea, but there is evidence that municipal broadband systems do behave differently than do private providers. In 2007, for example, I published a paper that showed that Competitive Local Exchange Carriers ("CLECs") were more likely to say they had operations in cities (in Florida) where an municipal electric utility had deployed some communications facilities.[91] These CLECs

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[87] *Navigating the Winding Municipal Broadband Road: A Case Study of Bellevue, Iowa,* INNOVATIVE SYSTEMS (undated) (available at: http://www.telecompetitor.com/clients/innovativesystems/casestudy/Bellevue_Case_Study.pdf).

[88] As shown in *Competition After Unbundling*, *supra* n. 56, the number of firms in equilibrium is smaller when price competition is more intense.

[89] With fixed entry costs, if the incumbent firm prices such as to earn a zero profit, then there is no incentive for another firm to enter. *See National Broadband Plan, supra* n. 2 at p. 136 (When "service providers in these areas cannot earn enough revenue to cover the costs of deploying and operating broadband networks, including expected returns on capital, there is no business case to offer broadband services…"); *see also The Broadband Availability Gap*, FCC OMNIBUS BROADBAND INITIATIVE (OBI) TECHNICAL PAPER NO. 1 (2010) at p. 1 ("[p]rivate capital will only be available to fund investments in broadband networks where it is possible to earn returns in excess of the cost of capital. In short, only profitable networks will attract the investment required.") (available at http://download.broadband.gov/plan/the-broadband-availability-gap-obi-technical-paper-no-1.pdf).

[90] *See, e.g.,* S. Crawford, CAPTIVE AUDIENCE: THE TELECOM INDUSTRY AND MONOPOLY POWER IN THE GUIDED AGE (Yale University Pres 2013) at Chapter 14. For a thorough critique of Crawford, *see* G.S. Ford, *Sloppy Research Sinks Susan Crawford's Book*, @LAWANDECONOMICS BLOG (January 18, 2013) (available at: http://www.phoenix-center.org/blog/archives/1075).

[91] Ford (2007), *supra* n. 23. The conclusions of this paper have been frequently exaggerated to claim that municipal broadband increases all forms of entry even though the empirical analysis does not support such a claim. *See, e.g.,* H. Feld, G. Rose, M. Cooper, and B. Scott, *Connecting the Public: The Truth About Municipal Broadband*, Consumer Federal of America, Consumers Union, Media Access Project, and Free Press (April 2005) (available at: http://www.freepress.net/sites/default/files/fp-legacy/mb_white_paper.pdf). Conflicting evidence is presented in J.A. Hauge, M.A. Jamison, and R. Gentry,

did not build local networks, but acquired portions of the local phone networks in a regulatory scheme called "unbundling," sometimes mingling these local network elements with their own facilities. My experience suggests that this increase in CLEC activity likely had to do with the more cordial relationships between CLECs and municipalities than with private providers regarding the locating of interconnection equipment. At the time, the private phone companies were forced to deal with CLECs on regulated terms, poisoning the relationships.[92] Subsequent to unfavorable court rulings and FCC decisions, as well as technological advances, very few CLECs exist today and those that do are mostly slaves to the regulations that protect them.[93]

Nevertheless, it is possible that the different (non-profit) objectives of municipal networks may stimulate some new types of retail competition not often seen with private networks. In fact, some municipal networks are "open networks" that permit retailers to offer services over the underlying network.[94] These types of investments do not, however, increase the number of providers of wireline service, which for some is the primary goal of modern policy. Also, the retail overlay on municipal systems has not proven to be a solid business plan, but that may change over time as the video distribution and voice services continue their dynamic transformation.

If we embrace the idea of a benevolent fiber-to-the-home monopolist, then we may very well ask what's the point of competition among private firms? This question, I believe, is at the hidden core of the municipal broadband debate, though it rarely surfaces in the advocacy. Broadband may be privately provided or publicly provided, but likely not both in the same market. A hybrid approach—a public-private partnership—may be the most sensible approach for economically-marginal communities (as detailed later). Evidence suggests that municipal involvement in broadband is moving in the direction of such partnerships.

Bureaucrats as Entrepreneurs: Do Municipal Telecommunications Providers Hinder Private Entrepreneurs?, 20 INFORMATION ECONOMICS AND POLICY 89-102 (2008) (available at: http://ssrn.com/abstract=1082823).

[92] Regulation creates the incentive to sabotage rivals even when such incentives are absent without regulation. *See, e.g.,* G.S. Ford and L.J. Spiwak, *Lessons Learned from the U.S. Unbundling Experience, supra* n. 59. The concept of "sabotage" is explored in technical detail in T. R. Beard, D. Kaserman, and J. Mayo, *Regulation, Vertical Integration, and "Sabotage"*, 49 JOURNAL OF INDUSTRIAL ECONOMICS 319 (Fall 2001) (available at: http://onlinelibrary.wiley.com/doi/10.1111/1467-6451.00152/abstract); *see also* D. Mandy and D. Sappington, *Incentives for Sabotage in Vertically Related Industries*, 31 JOURNAL OF REGULATORY ECONOMICS 235-260 (2007).

[93] *Lessons Learned from the U.S. Unbundling Experience, id.*

[94] M. Zager, *Municipal Utilities Deliver Fiber to the Premises*, BROADBAND PROPERTIES MAGAZINE (May 2008) (available at: http://www.broadbandproperties.com/2008issues/may08/BBP_May08_FiberDeployments.pdf); A. Cohill, *Worst Practices in Community Broadband – Part Two*, BROADBAND PROPERTIES MAGAZINE (August/September 2014) (available at: http://www.wideopennetworks.us/handouts/WorstPractice_BPP_2014.pdf).

B. *Municipal Broadband is Subsidized Entry*

Evidence shows that municipal broadband systems are always, and sometimes heavily, subsidized by various levels of government including the municipality. In fact, the "*no one else will*" argument for municipal broadband networks implies the need for subsidies.[95] It also indicates that the subsidies are asymmetric, since if the funds were generally available we would likely see more private entry using those subsidies. While hardly disputable, I will nevertheless provide a simple economic analysis to illustrate the need for subsidies. This analysis syncs up well with the preceding discussion, but the discussion now changes a bit by looking at a simple incumbents-entrants game.

Say there is a market served by two identical firms (a symmetric duopoly). The incumbents each earn a stream of profit equal to D. Another firm is deciding whether or not to enter the market in competition with the duopoly knowing that, upon entry, it must spend an amount F to enter. If the firm chooses to enter the market as the third provider, then the three firms split the market evenly and each earns a gross profit of T. The potential entrant enters only if it can do so profitably, so it enters if $T > F$; that is, the expected gross profit from selling the good in competition with the incumbents (T) exceeds the entry fee (F). If $T < F$, then the potential entrant stays out and the market remains served by a duopoly. If we observe the persistence of duopoly, then entry as the third competitor is not profitable ($T < F$). Note that T is determined by the intensity of competition. If competition is intense, then T will be small and entry less likely. If competition is weak, then T will be larger and entry more likely. Paradoxically, the presence of few providers may be evidence of intense competition rather than a lack of it.

A numerical example may be helpful. Say that each duopolist earns a profit of $50 (for a total industry profit of $100). If a third firm enters, then each firm earns a profit of $25 (for a total industry profit of $75).[96] If entry costs are less than $25, then the potential entrant can profitably enter. If entry costs exceed $25, then it will not enter and the duopoly persists. What we observe about a market tells us a great deal about the economics of that market.

On average, U.S. households may obtain wireline broadband service from two providers, so this "no entry" by the third firm scenario is a reasonably approximation of the existing situation. There is some activity by the private sector to increase that number

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[95]   Some cities have apparently tried to minimize the subsidization of the networks and have claimed to not use taxpayer funds. *See, e.g.,* J. Brodkin, *Where Broadband is a Utility, 100Mbps Costs Just $40 a Month*, arstechnica.com (August 4, 2015) (available at: http://arstechnica.com/business/2015/08/how-a-small-city-offers-60-gigabit-fiber-with-no-taxpayer-subsidies), where the author and city manager indicated the system did not require subsidy dollars. However, the Sandynet network received a federal grant, so it is a subsidized system. *See* FEDERAL BROADBAND DEPLOYMENT PROGRAMS AND SMALL BUSINESS, Government Accountability Office, GAO-14-203 (February 2014) (available at: http://www.gao.gov/assets/670/660734.pdf). It could be argued that these subsidy funds were generally available. It is also often hard to detect the extent of subsidization, especially when resources are shared between the city and broadband system. I cannot exclude the possibility that some of the networks are not subsidized in any way, but I would be very surprised to see it. Many municipal systems readily admit to subsidization.

[96]   The additional competition is expected to reduce prices and industry profits.

to three providers, but it is not yet widespread.[97] Yet, municipal systems, particularly in cities with their own municipal electric utility, are popping up across the country.[98]

Why are the municipalities doing something the private sector is not? To explain this, consider a case where one firm has an advantage over other potential entrants. Say, for instance, that one firm is offered a subsidy of some sort (labeled *S*). This subsidy may improve revenues, lower expenses, or reduce entry costs, but in all cases it alters the entry condition for this potential entrant. The third firm will enter if $T + S > F$. The larger the subsidy, of course, the more likely this condition is satisfied and the firm can profitably enter. Going back to the numerical example, say entry costs are $30 so that being the third competitor is not profitable (i.e., $25 < $30). One potential entrant, however, qualifies for a $10 subsidy if it enters. Now, the benefits of entry include the post-entry profit and the subsidy ($25 + $10 = $35), which is above the entry cost of $30 (giving a net payoff from entry of $5). In this scenario, in the absence of a subsidy the duopoly persists, but with the subsidy a firm enters and we have three firms offering services. The incumbent firms do not get the subsidy, so their ability to remain in business at below-cost rates is up for question.

The logic of this entry game is straightforward and useful. In most areas of the U.S., additional private entry is not profitable (or, from the model above, $T < F$) as is demonstrated by the lack of it. Even if a municipal entrant is as efficient as private sector firms, it is unprofitable for the municipality to enter as the third seller.[99] The argument that the municipality's decision to enter because "no one else will" requires that the municipality has an advantage that private firms do not.[100] That is, the municipal entrant receives a subsidy (*S*) of some sort sufficiently large to make entry profitable. If "no one else will," then this subsidy (or advantage) must be unique to the municipal entrant; the

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[97]   Google has announced plans to build fiber networks in parts of Kansas City, Austin, Atlanta, Charlotte, Nashville, and a few other cities. *See* J. Brodkin, *Google Fiber Confirmed for Four New Metro Areas, 18 Cities*, ARSTECHNICA.COM (January 27, 2015) (available at: http://arstechnica.com/business/2015/01/google-fiber-confirmed-for-four-new-metro-areas-18-cities); M. Reardon, *Google Exec Sees Google Fiber as a "Moneymaker"*, CNET.COM (May 30, 2013); S. Fiegerman, *The Future of Google Fiber: Why the Search Giant Is Betting on Broadband*, MASHABLE (February 19, 2014) (available at: http://mashable.com/2014/02/19/google-fiber-expansion/#1hZHFIay7Skt). It's hard to generalize from this experience since their motivations for entry are unclear. Also, the pursuit of Google by some cities stands in stark contrast to the less favorable treatment of incumbent cable and telephone companies. Smaller providers like WOW! are also entering select markets (www.wowway.com).

[98]   Municipal electric systems operate as monopolies for electric services and thus do not require much if any subsidization. Economic studies suggest that municipal electric systems operate as efficiently as investor-owned utilities, at least if the municipal system is small or moderately sized. *See*, *e.g.*, D. Koh, S.V. Berg, and L.W. Kenny, *A Comparison of Costs in Privately Owned and Publicly Owned Electric Utilities: The Role of Scale*, 72 LAND ECONOMICS 56-65 (1996).

[99]   *See*, *e.g.,* A.M. Kovacs, *Municipal Broadband: A Financial Perspective*, in Davidson and Santorelli, *supra* n. 13 ("Municipalities are unlikely to have either scale in purchasing telecommunications equipment or experience in constructing and running broadband networks."); M.J. Balhoff and R.C. Rowe, *Municipal Broadband: Digging Beneath the Surface*, Balhoff & Rowe, LLC (September 2005) (available at: http://www.balhoffrowe.com/pdf/Municipal%20Broadband--Digging%20Beneath%20the%20Surface.pdf).

[100]   Municipalities can't point to the social benefits because they are not monetized.

government is subsidizing the government entity through asymmetric policies that grant subsidies only to the municipality's system.

What do I mean by a subsidy? There is no standard definition of "subsidy." Rather, what is and isn't a subsidy depends on the circumstances. Subsidies do take familiar forms. Most obviously, a subsidy may involve a direct cash transfer from the government to an entity, which is common for municipal networks. Subsidization can take many other and less direct forms. Loan guarantees or preferential interest rates on debt are types of subsidies also commonly seen for municipal networks. Another type of subsidy is when a government provides goods or services at no cost or below market prices to an entity. The use of a city's resources by its own municipal network is almost certain to occur, whether explicit or implicit. Such sharing may very well constitute a subsidy.

Also, municipal networks today are very common in cities that provide their own electricity through a municipally-owned utility. In fact, most municipal networks are now attached to a municipal electric utility. The sharing of a municipal electric utility's resources with its broadband network and the shifting of broadband costs to electric customers are other potential sources of subsidy. Normally, policymakers, regulators, and even political interest groups frown upon cross-subsidization by a monopoly utility into a competitive market, yet municipal broadband systems are routinely recipients of such subsidies.[101] Differential regulation can also result in a subsidy to firms that have a more favored status. Are municipal systems forced to engage in the same type of franchising procedures as are private firms? Does the municipality charge the sometimes exorbitant pole attachments rates (paid to it by private providers) to its own broadband division?[102] If not, then the regulatory system is providing a subsidy to the municipal system.

In contemplating the costs of subsidized municipal entry, it is important to recognize that subsidies dollars are costly. Monies used to support the losses incurred by government-run networks are obtained through various forms of taxation, whether national, state, or local. Taxes introduce distortions and create welfare losses. Economists

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[101] The cross-subsidy issue was litigated for the Bristol-Virginia municipal system. Virginia law prohibits such cross subsidies. Virginia's State Corporation Commission found the evidence did not support a cross subsidy from the electric to the broadband network. P. Miller, *Bristol's Broadband Push*, VIRGINIABUSINESS.COM (November 2006) (available at: http://www.baller.com/wp-content/uploads/Bristol_VBM_Nov06.pdf). In other cities, however, transfers from the electricity utility and broadband system are not so limited. *See, e.g.,* S. Titch, *Spinning its Wheels: An Analysis of Lessons Learned from iProvo's First 18 Months of Municipal Broadband*, REASON FOUNDATION (Dec. 2006)(available at: http://reason.org/files/33224c9b01e12f3b969f4257037c057e.pdf)("request $1 million in additional funds from the Provo's electric utility to meet its costs").

[102] *A Working Model for Broadband Expansion*, COALITION FOR THE NEW ECONOMY (May 14, 2014)(available at: http://www.coalitionfortheneweconomy.org/blog/2014/05/a-working-model-for-broadband-expansion) (claiming Chattanooga's broadband network does not pays the very high pole attachment rates that are set by the municipality and paid by private firms); L. Spiwak, *Pole Tax: Government Slows Down Broadband*, TIMES FREE PRESS (April 3, 2013) (available at: http://www.timesfreepress.com/news/opinion/freepress/story/2013/apr/03/pole-tax-government-slows-down-broadband/104172); M. Glans, *Research & Commentary: Pole Attachment Fees*, HEARTLAND INSTITUTE (March 12, 2013) (available at: https://www.heartland.org/policy-documents/research-commentary-pole-attachment-fees).

refer to such costs as the marginal cost of public funds, and economic research indicates that subsidy dollars can be quite expensive.[103] Say, for example, that a dollar raised through taxation costs society in $1.25 in resources, which is at the lower end of the estimates of the marginal cost of public funds. If the dollar of spending doesn't produce at least a return of $0.25, then the whole tax-subsidy scheme is socially wasteful. The higher the marginal cost of public funds, the harder it is to justify a subsidy.

When the finances of a municipal system are evaluated (usually for the policy debate), not only are the sometimes enormous subsidies ignored, but the cost of producing the subsidy dollars is overlooked. Just because the federal government pays huge portions of the network costs of a municipal system does not mean those costs are not real. Ignoring subsidies is especially problematic when municipal systems compete with unsubsidized private firms, as the municipal system is making decisions based on a cost level that is not equal to the true cost of providing service; the private firm must do so. The municipal system's managers may very well believe that they are pricing in a manner to cover costs, but if many of the costs are ignored, the pricing policies are anticompetitive in nature. Later in the text, I will discuss in more detail this "predatory" nature of municipal broadband.

C. *Direct Subsidies*

As the theory suggests would be the case, the evidence shows that subsidies to municipal broadband systems are commonplace. In fact, it is difficult to find an example where a direct subsidy was not provided, though I cannot exclude the possibility that it has happened.[104] Many municipal systems received grants and favorable loans from federal programs including those made available from the American Recovery and Reinvestment Act of 2009 (for which funding has now ended) and programs offered by the Rural Utilities Service.[105]

Take, for example, Chattanooga's broadband system. It received a $111 million grant from the U.S. Department of Energy—funds made available by the American Recovery and Reinvestment Act.[106] This grant (not loan) covered about one-third of the total construction costs. There are a number of interesting facts about this grant worth noting. First, this grant represents a gift from *all* Americans, not just Chattanoogans, of about

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[103]   E.K. Browning, *The Marginal Cost of Public Funds*, 84 JOURNAL OF POLITICAL ECONOMY 283-298 (1976); A. Snow and R.S. Warren, *The Marginal Welfare Cost of Public Funds: Theory and Estimates*, 61 JOURNAL OF PUBLIC ECONOMICS 289-305 (1996); B. Dahlby, THE MARGINAL COST OF PUBLIC FUNDS (2008).

[104]   *See, e.g.,* fn. 6 and citations therein.

[105]   *See, e.g.,* G.T. Rosston and S. Wallsten, *The Broadband Stimulus: A Rural Boondoggle and Missed Opportunity*, TECHNOLOGY POLICY INSTITUTE (November 2013) (available at: https://www.techpolicyinstitute.org/files/rosston_wallsten_the_broadband_stimulus.pdf);   L.G. Kruger, *Broadband Loan and Grant Programs in the USDA's Rural Utilities Service*, CONGRESSIONAL RESEARCH SERVICE 7-5700 (July 12, 2013) (available at: https://www.fas.org/sgp/crs/misc/RL33816.pdf).

[106]   http://www.cga.ct.gov/2012/rpt/2012-R-0515.htm.

$2,000 per subscriber.[107] The municipal broadband system in Bristol-Virginia has received $90 million in grants, which equals about $7,200 per-customer for its 12,500 customers.[108] Verizon, alternately, spent about $750 per home passed and $600 (without subsidies) to connect a customer to its fiber-optic system (located in more urban markets).[109] In this light, the magnitude of the subsidy received by some municipal systems is, quite bluntly, scandalous and should force some skepticism about the wisdom of municipal broadband.

Second, such government subsidies stand in stark contrast to the government's treatment of the private sector, as the nation's major broadband service providers do not receive such generous financial help from the federal government. Indeed, the FCC's subsidization rules for private carriers targets only unserved areas, excluding areas already served by an unsubsidized carrier.[110] Plainly, subsidizing municipal systems in markets already serviced by the private sector is asymmetric subsidization by the government to a government entity. Even in areas where subsidization of the private providers does occur, the average subsidy available is much lower than seen for many municipal systems even though the private carriers would receive no subsidy to serve many cities where municipal systems have been deployed.[111]

Another interesting statistic is to compute the subsidy size for a private carrier if it was equivalent to the subsidy given to some municipal projects. For example, a federal grant of $111 million to Chattanooga's system is the unit-passed equivalent ($650 per home) of a $35 billion grant to Comcast Corporation, which is about 11-times the annual investment of Comcast in its broadband infrastructure.[112] At the subsidy rate of the Bristol-Virginia

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[107] EPB Financial Statement (2013) (available at: https://www.epb.net/flash/annual-reports/2013/downloads/EPB_Financials_2013.pdf).

[108] Davidson and Santorelli, *supra* n. 13, at p. 49; *Virginia Tobacco Commission: Funding Revitalization and Innovation in the Tobacco Region*, Virginia Tobacco Commission (June 2011)(available at: http://www.tic.virginia.gov/images/VA%20Business%20Magazine%20Ads/Broadband/June%202011%20Virginia%20Business%20Magazine%20Broadband.pdf); *About Us: Corporate History*, BVU (visited September 2015) (available at: http://www.bvu-optinet.com/index.php/about-us/corporate-history).

[109] M. Reardon, *Verizon Nears Fios Nework Completion*, CNET.COM (March 29, 2010) (available at: http://www.cnet.com/news/verizon-nears-fios-network-completion).

[110] *In the Matter of Connect America Fund ETC Annual Reports and Certifications Petition of USTelecom for Forbearance Pursuant to 47 U.S.C. § 160(c) from Obsolete ILEC Regulatory Obligations that Inhibit Deployment of Next-Generation Networks*, FCC 14-190, REPORT AND ORDER, 29 FCC Rcd 15644 (rel. December 18, 2014) at ¶73 ("to ensure support is targeted to areas lacking 4/1 Mbps, we will exclude from the offer of Phase II model-based support to price cap carriers any census block served by a subsidized facilities-based terrestrial competitor that offers fixed residential voice and broadband services meeting or exceeding 3 Mbps/768 kbps speed requirement") (available at: https://apps.fcc.gov/edocs_public/attachmatch/FCC-14-190A1.pdf).

[111] *Up To 600,000 Rural Homes and Businesses in 44 States and Puerto Rico Will Gain Access to Broadband for First Time: Over $385 Million From FCC's Connect America Fund To Leverage Private Investment For Expanding Broadband In Unserved Areas*, FCC PRESS RELEASE (August 21, 2013) (available at: https://www.fcc.gov/document/connect-america-fund-expands-broadband-600k-homes-businesses).

[112] Comcast Form 10-K (2013, 2014) (available at: http://www.cmcsa.com/annuals.cfm).

system, the customer-equivalent grant to Comcast would be a whopping $390 billion, or over 100-times Comcast's annual capital expenditure and greater than all annual investment in broadband infrastructure.[113] When put into context, the sizes of the subsidies received by some municipal systems are shocking.

     D. *Indirect, Implicit, and Cross Subsidies*

The explicit subsidization of municipal broadband systems is nearly ubiquitous, but there are also plenty of indirect and implicit subsidies as well. Subsidies flow not only from the federal government, but also from the cities themselves. In many cases, there is no attempt to hide such subsidies. In Paragould-Arkansas, for example, the city raised the property tax from 2.76 mills to 2.825 mills to fund the municipal system after financial projections did not meet the target.[114] In Ashland-Oregon, in addition to sizeable transfers from the electric and water utilities to the broadband network, the city approved a $7.50 per month fee on electric customers to subsidize the broadband network.[115] A manager for the system in Sallisaw-Oklahoma said, "[o]ur project is not yet paying for itself. We're still using other utility funds to pay for it."[116]

Internal subsidies are not always so apparent. Consider again the system in Chattanooga. Chattanooga's broadband system is constructed and maintained by the city's municipal electric firm (Chattanooga Electric Power Board, or "EPB"). The initial justification for Chattanooga's fiber deployment was the cost savings it might generate for the electricity division.[117] As such, the construction of the broadband network was paid for by $229 million in revenue bonds and a $50 million loan to the broadband division from the electric division.[118] It appears that the larger debt ($229 million) is being serviced by captive ratepayers, not the broadband customers, for the purposes of Smart Grid technologies. Yet, Smart Grid applications do not require fiber optic connections to households, and home metering and real-time pricing can be accomplished using cheaper and available technologies (capable of a 500 Kbps connection).[119] Also, financial analyses,

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[113]   http://www.ustelecom.org/broadband-industry/broadband-industry-stats.

[114]   *Wi-Fi Waste*, *supra* n. 13, at p. 24.

[115]   V. Aldous, *Ashland, Ore., Transfers Funds to ISP*, MAIL TRIBUNE (Jan 19, 2006). The $.7.50 fee was later dropped in response to public outrage.

[116]   P. Hill, *Results Mixed with Municipal Cable Systems*, THE CITY WIRE (April 3, 2012)(available at: http://www.thecitywire.com/node/21257#.VfbJlhHBzRY).

[117]   *See* Electric Power Board of Chattanooga, Tennessee Petition for Preemption of a Portion of Section 7-52-601 of the Tennessee Code Annotated Pursuant to Section 706 of the Telecommunications Act of 1996 for Removal of State Barriers to Broadband Investment and Competition at pp. 23-24 (available at: https://www.epb.net/downloads/legal/EPB-FCCPetition.pdf).

[118]   *See, e.g.,* Davidson and M. Santorelli, *supra* n. 13; C. Mitchell, *Broadband at the Speed of Light: How Three Communities Built Next-Generation Networks*, Benton Foundation (April 2012) (available at: http://www.ilsr.org/wp-content/uploads/2012/04/muni-bb-speed-light.pdf).

[119]   *An In-Depth Look at Click! Financials*, Tacoma Public Utilities (May 20, 2015) (available at: http://www.clickcabletv.com/file_viewer.php?id=1911) ("Tacoma Power doesn't need a wired telecommunications network for metering (at p. 24)"; "Did not foresee the industry evolution to wireless power metering systems (at p. 23)".); P. Fuhr, W. Manges, T. Kuruganti, *Smart Grip Communications*

including one by an independent auditor, indicate that only about 4-6% of the costs of a broadband network are reasonably assigned to a municipal electric utility.[120]   Even assuming a generous 10% allocation to Smart Grid, Chattanooga's captive ratepayers were forced to assume $206 million in debt for the broadband customers, or about $3,700 per broadband subscriber. Shifting the costs of the fiber network to electricity customers is a subsidy. In fact, it is a cross-subsidy from the captive ratepayers of a monopoly electric utility to an affiliated broadband network in a competitive market. State regulators would almost certainly forbid such cross subsidization by investor-owned utilities, indicating that municipalities are operating under different standards than are private companies.

Indeed, the lack of fiber-to-the-home networks being built by investor-owned electric utilities is a potent piece of evidence. The incremental cost of adding broadband to an electric utility may be lower than it is for a firm without infrastructure and resources already deployed in the relevant market. Such spillovers need not be subsidies. Indeed, spillovers allowed the cable companies into the phone business, the phone companies into the video business, and both into the broadband business. But if there were sizable spillovers from the electric utility into the residential communications business, then we should see investor-owned utilities doing so. We do not.

When the *Telecommunications Act of 1996* was passed, there was a great hope that electric utilities would enter aggressively into telecommunications markets.[121]   For the investor-owned utilities, however, that aggressive entry never occurred. Why? The principle reason is that politicians and regulators see it as their job to protect captive ratepayers from unnecessary risk, and building and operating a broadband network is exceedingly risky. For this reason, investor-owned utilities are closely-scrutinized by state Public Utility Commissions ("PUCs") to make sure that anything that goes into a utility's rate base is "used and useful" to the utility's core electric business.[122]   If a utility tried to sneak in the costs of entry into the rate base any costs not related to the core electric business, the prudency hearing would not be pleasant. The risk-adverse investment culture that characterized electric utilities and their regulators effectively precludes investor-owned utilities from leveraging their electric monopoly into the communications business.

Bandwidth Requirements: An Overview, SG COMMUNICATIONS TECHNOLOGY REVIEW (February 2011) (available at: http://trustworthywireless.ornl.gov/pdfs/Smart-Grid-Communications-Overview-Bandwidth-2011.pdf); C. Butler, *Chattanooga Residents Get Internet, Courtesy of Taxpayers*, TENNESSEEWATCHDOG.NET (December 21, 2011) (available at: http://watchdog.org/1019/tn-chattanooga-residents-get-internet-courtesy-of-taxpayers) ("the manager of Chattanooga's system] admitted last month they could get the same information, and with the same accuracy, without the Smart Grid").

[120]   *An In-Depth Look at Click! Financials, id*, at pp. 28-33.

[121]   *See In The Matter Of Implementation of Section 34(A)(1) of the Public Utility Holding Company Act of 1935, as Added by Section 103 of the Telecommunications Act of 1996*, FCC 96-376, REPORT AND ORDER, 11 FCC Rcd. 11377 (rel. September 12, 1996).

[122]   *See, e.g., Electricity Regulation in the US: A Guide*, REGULATORY ASSISTANCE PROJECT (March 2011) (available   at: http://www.raponline.org/docs/RAP_Lazar_ElectricityRegulationInTheUS_Guide_2011_03.pdf);

Yet, while entry from investor-owned utilities over the past twenty years has been minimal, municipal entry has been aggressive. In large part, we can attribute such entry by municipal utilities to the lack of regulatory oversight aimed at protecting the customers of the electric utility. Unlike their investor-owned counterparts, because municipal utilities generally face no oversight from state PUCs as to what and what may not be included into the ratebase but are, instead, often *self-regulated* by their own city councils, municipal utilities have much more leeway to use captive electric ratepayers to subsidize entry into broadband.[123] State laws can act as a check, if not the only check, on municipal government's cross subsidy of broadband services. The ease with which a cross subsidy may be implemented between an electric utility and an affiliated broadband network goes a long way to explain why municipal networks are often built in cities operating an electric utility. In numerous cases, the captive ratepayers are paying for failed municipal broadband projects.[124] While it is not possible to eliminate the possibility of legitimate positive spillovers from the electric utility to the broadband network, the lack of investor-owned utility entry into the broadband market indicates that such spillovers are not large enough to motivate entry. Thus, subsidization is likely required to induce entry even by municipal electric utilities into the broadband business.

E. *Predatory Entry*

Private entry does not occur when it is unprofitable, which means that expected revenues after entry are insufficient to cover expected costs. Yet, as just discussed, municipal systems enter when "no one else will" implying, in all likelihood, asymmetric subsidies are involved. The evidence affirms the logic.

If too little revenues are the result of the municipal system offering high prices and low quality, thereby obtaining low market share, then the municipal system won't last long and it will have accomplished nothing. Instead, advocates for municipal entry claim that municipal systems offer lower prices and higher quality in pursuit of the positive externalities associated with broadband. Whatever the goal, these systems take market share from the private incumbents, obtaining on average a market share of around 50% to 60%.[125] As detailed above, eventually this additional entry will drive some, if not all, private incumbents from the market, or at least substantially reduce their presence and investments and reduce their returns. It is in this sequence of events where the problem with subsidized entry becomes apparent. If a subsidy is required for entry and sustained

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[123]   *See Nixon v. Missouri Municipal League,* 541 U.S. 124, 134 (2004) ("when a government regulates itself (or the subdivision through which it acts) there is no clear distinction between the regulator and the entity regulated. Legal limits on what may be done by the government itself (including its subdivisions) will often be indistinguishable from choices that express what the government wishes to do with the authority and resources it can command.")

[124]   *See, e.g.,* Davidson and Santorelli, *supra* n. 13.

[125]   St. John, *supra* n. 29; J. Karami, *What Can Tacoma Teach Seattle About Muni Broadband?*, SEATTLE WEEKLY NEWS (June 30, 2015) ("to be sustainable, this new network would need to capture over '40 percent of the broadband market at a subscriber cost of $75 per month to be financially viable over the long term,'") (available at: http://www.seattleweekly.com/news/959329-129/what-can-tacoma-teach-seattle-about).

operations, then by implication average price is below average incremental cost.[126] Subsidized entry, therefore, may lead to predatory pricing (prices below incremental cost).[127] While increased availability and adoption are noble goals, strangely enough it is this drive to increase output (and thus the externality benefits) that makes municipal entry more likely to be predatory.

The word "predatory" typically invokes antitrust law.[128] Cities are likely to believe they are immune from antitrust law, both because of their status as "government" and because they are merely serving the interest of the public and not pursuing profit. Interestingly, in 1978, the United States Supreme Court in the case of *City of Lafayette, Louisiana v. Louisiana Power and Light* rejected this public interest argument when it held that municipalities are not immune from the antitrust laws under the "state action" doctrine of *Parker v. Brown* when they compete directly for customers with the private sector.[129] There, municipalities argued that the antitrust laws are intended to protect the public from abuses of private power and not from utilities "that exist to serve the public weal." The Court rejected this argument, finding that the municipalities' argument that "their goal is not private profit but public service" to be only "partly correct." As the Court explained:

> Every business enterprise, public or private, operates its business in furtherance of its own goals. In the case of a municipally owned utility, that goal is likely to be, broadly speaking, the benefit of its citizens. But the economic choices made by public corporations in the conduct of their business affairs, designed as they are to assure maximum benefits for the community constituency, are not inherently more likely to comport with the broader interests of national economic well-being than are those of private corporations acting in furtherance of the interests of the organization and its shareholders. The allegations of the counterclaim, which for present purposes we accept as true, aptly illustrate the impact which local governments, acting as providers of services, may have on other individuals and business enterprises with which they inter-relate as purchasers, suppliers, and sometimes, as here, as competitors.[130]

While the Court noted that municipal systems "may, and do, participate in and affect the economic life of this Nation in a great number and variety of ways," the Court held that

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[126] In regards to the entry decision, "below costs" implies that the total revenues of the entrant are below the total cost, since all costs are incremental. In the presence of legitimate spillovers, total costs are the incremental cost of adding the broadband network to whatever resources are already in use.

[127] *See also Wi-Fi Waste, supra* n. 13, for a similar claim.

[128] W.K. Viscusi, J.M. Vernon, J.E. Harrington Jr., Economics of Regulation and Antitrust (1995) ("pricing at a level calculated to exclude from the market an equally or more efficient competitor (at p. 272)")("Areeda and Turner propose [] a price below reasonably anticipated average variable cost should be conclusively presumed unlawful (at p. 285)").

[129] *City of Lafayette, Louisiana v. Louisiana Power and Light*, 435 U.S. 389 (1978).

[130] *Id.* at 403.

When these bodies act as owners and providers of services, they are fully capable of aggrandizing other economic units with which they interrelate, with the potential of serious distortion of the rational and efficient allocation of resources, and the efficiency of free markets which the regime of competition embodied in the antitrust laws is thought to engender. If municipalities were free to make economic choices counseled solely by their own parochial interests and without regard to their anticompetitive effects, a serious chink in the armor of antitrust protection would be introduced at odds with the comprehensive national policy Congress established.[131]

So while a city may view its actions to be to be "benefit of its citizens," doing so does not imply the city is incapable of or excused from anticompetitive conduct that may lead to a "serious distortion of the rational and efficient allocation of resources, and the efficiency of free markets." "Parochial interests" do not nullify "anticompetitive effects."

Furthermore, externalities are, by definition, external, which means they are not monetized by the seller. Choosing prices, quality, or other factors without consideration of their financial implications is certain to reduce profit margins. A profit maximizing firm chooses its prices to maximize the spread between revenues and incremental (or marginal) cost. Any other strategy will lead to a lower spread between the two. Thus, the argument that a city may pursue objectives other than profit only strengthens the case for predatory entry, since subsidies must rise to account for the larger losses caused by the deviation from profit maximization.

Whether or not the inherent predatory nature of municipal entry in a market already served by others is actionable on antitrust grounds is an interesting question. For the most part, economic and legal experts frown upon predatory pricing claims, though some have been successful.[132] In the normal thinking, predatory pricing is not profitable unless the firm can raise price after its rivals exit. Doing so, however, may draw an entrant back in, thereby making the predatory strategy unprofitable. Such an argument depends on profit maximization and municipal systems often claim not to be profit maximizers. Thus, predation in the context of municipal entry is uncharted territory from a theoretical (both legal and economic) perspective. A lack of a profit motive makes existing case law and economic theories about predation mostly uninformative.

F. *Private Investment and the Threat of Municipal Entry*

When the FCC recently preempted state municipal broadband laws in Tennessee and North Carolina, the Commission's action was intended to spur municipal investment in

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[131]   *Id.* at 408.

[132]   For a thorough review of predatory pricing in antitrust, *see* P. Bolton, J.F. Brodley, and M.H. Riordan*, Predatory Pricing: Strategic Theory and Legal Policy*, U.S. Department of Justice (2006) (available at: http://www.justice.gov/sites/default/files/atr/legacy/2006/10/30/218778.pdf).

networks.[133] Naturally, in response to the Commission's action, private firms will increase their assessment of the threat of municipal entry. In the FCC's 2015 *Preemption Order*, the Agency expressed the view that "threat of entry or actual entry of a municipal provider spurs positive responses by the incumbent broadband provider [which] serves the goals of section 706."[134] In contrast (and as noted above), the FCC observed in its *National Broadband Plan* that "[m]unicipal broadband has risks. Municipally financed service may discourage investment by private companies."[135] As is typical of the FCC, no supporting analysis is provided of either of these *conflicting* claims; a shortfall I make some attempt to remedy here. I have already discussed the likelihood that municipal entry will lead to the exit of either the public or a private provider. Here, I will show, using the economic model presented above, that *the mere threat* of municipal entry may discourage private investment.

Consistent with the general claim that wireline broadband services are provided by a duopoly, take the model from the previous section and set $f = A^2/9$ so that $n^* = 2$. Suppose, however, that there is only one firm in the market and the second firm is only now considering the possibility of entering the market. Furthermore, suppose the second firm assigns the probability θ to the possibility that an equally-efficient municipal firm (leading to a symmetric outcome) will also enter the market to compete with the existing private monopoly. As always, the second private firm would only enter the market if the expected profit was greater than or equal to zero. Hence, the private firm will enter if:

$$E\{\pi\} = (1-\theta)0 + \theta A^2\left(\tfrac{1}{16} - \tfrac{1}{9}\right) \geq 0 \,. \tag{11}$$

The first part of the left-hand side of Expression (10) is the realized profit after entry (the marginal profit is 0 in the equilibrium structure) multiplied by the probability the municipality does not enter; the second-part is the profit with three firms multiplied by the probability the municipality does enter.

Expression (11) can only be met if $\theta = 0$. In other words, if there is any credible threat of municipal entry ($\theta > 0$), then the second private firm would not enter, thus generating a private monopoly in the market. However, if there is no threat of municipal entry ($\theta = 0$), then the second private firm would enter. This example shows that even a small probability of municipal entry can prevent private sector entry, thus artificially generating monopoly conditions in the marketplace. States with laws overseeing municipal broadband may have some advantage in attracting private investment. Indeed, 75% of cities where Google has already deployed fiber and 100% of cities where the company has upcoming deployments are in states with municipal broadband laws.[136]

The logic of this argument has a more general application. Broadband technology is constantly improving. Thus, at any given time, the technology used is somewhat dated. Of course, companies cannot invest in every technological advance that comes along,

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[133]   *2015 Preemption Order, supra* n. 6.

[134]   *Id.* at ¶ 49.

[135]   *National Broadband Plan, supra* n. 2 at p. 153.

[136]   Lichtenberg, *supra* n. 14; https://fiber.google.com/newcities (visited February 9, 2016).

especially when an even better one is expected in the near future. At some point, however, the companies must pull the trigger in order to provide the service quality their customers demand, knowing that it won't be long before the technology is once again "dated." At present, we are in the midst of such a massive technological upgrade—the move to very high-speed networks. Fiber is one technology, but the cable companies have proven their fiber-coaxial networks are capable of very high speeds as well. Right now, private providers are making their computations about upgrading their networks and have already begun to deploy in many cities. The threat of municipal entry, or the realization of municipal entry, alters fundamentally that calculation, likely weakening the case for investing in upgrades. In this respect, it's a really bad time to be pushing municipal entry. On the other hand, as larger cities get their upgrades, smaller cities likely feel an increasing pressure to keep up. Given the long-term nature of broadband investments, the temporal issues are very complex and very interesting.

G. *State Laws Governing Municipal Entry*

The (recently preempted) North Carolina law overseeing municipal broadband includes (almost exclusively) provisions that restrain the subsidization and cross-subsidization of municipal systems. One critic of the law sums up the municipal broadband issue, and oddly enough the economic analysis above, quite well, stating:

> While [these subsidy] restraints serve a critical function in preserving private ISPs' ability to compete effectively, they also impede public network construction by making the public network less financially viable. Assuming private ISPs refuse to enter the market because they do not believe they can provide service at a profit, or even at a break-even point, no municipality would be able to enter an unserved market given these restraints. The entire reason for municipal networks in unserved markets is to overcome the private sector's unwillingness to enter the market.[137]

While this quote is from an article advocating for municipal broadband, it lays out, perhaps inadvertently, the dangers of municipal entry and the reason for states law to exist.[138] Municipal broadband is subsidized entry, a finding that flows directly from the "no one else will" argument made in this quote and by advocates of municipal entry. Without subsidies, municipal entry is highly improbable, for the same reasons private entry does not occur. Municipal entry cannot "promote competition." If anything, the count of providers will remain unchanged or fall. Moreover, when the government

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[137]   J. Stricker, *Casting a Wider "Net": How and Why State Laws Restricting Municipal Broadband Networks Must be Modified*, 81 GEORGE WASHINGTON LAW REVIEW 589-626 (2013) at p. 615.

[138]   The FCC's *2015 Pre-emption Order*, *supra* n. 6 at ¶¶ 62, 107, 112, makes the same type of argument, describing the North Carolina law's restrains on subsidization as a deterrent to entry ("even if we focus on taxpayer protection, as some request, the evidence before us suggests that the Tennessee and North Carolina laws before us actually increase the likelihood of failure because of the barriers that they erect to the successful deployment of broadband infrastructure by these entities (¶ 62)").

subsidizes the entry of its own firm into a market and drives down price, there is a reasonable case that the entry is predatory and thus anticompetitive.

In light of the potential predatory nature of municipal entry, it is little surprise that the private sector wishes to see some state controls over municipal entrants, and little surprise states have passed laws to oversee municipal entry. Municipal broadband is not means to "promote competition"; it is a means to displace or *eliminate it*. Moreover, it is not unreasonable to question how the private sector can compete with government-owned firms receiving thousands of dollars in subsidies for each of their customers. Unlike the claims of the FCC and others, these laws do not simply reflect the lobbying prowess of the broadband companies (as the FCC leadership appears to believe).[139] These laws reflect a reasoned assessment of the nature and risks of municipal entry. Perhaps some provisions of these laws are poorly crafted, but state control of municipal entry has sound economic support. State control over its subdivisions is certainly no more radical and has far better support than does the government subsidizing itself to enter a business to *compete* with the private sector.[140]

VI. Externalities, Competition and Subsidies

The "promoting competition" argument for municipal broadband is logically unsound. And, I doubt most city officials are at all concerned about increasing competition and probably wish they didn't have to share the market with private firms. Most of the city officials involved in these projects simply want to increase broadband adoption to help their community transition more smoothly and robustly to the information economy. Building a network is difficult, expensive and risky, yet some city officials do so nonetheless, suggesting they perceive the stakes to be high but their options limited.

A. *Subsidies vs. Entry*

If obtaining the positive externalities is the goal, then it is important to ask whether there are better methods to reap the positive externalities than by a municipality taking on the financial risk of building a broadband network. The presence of these positive externalities implies that the socially optimal aggregate quantity is above the level achieved in the private long-run equilibrium because private firms cannot capture the value of the external effects.[141] I will now consider a subsidy as an alternative solution to

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[139]   *2015 Pre-emption Order*, *supra* n. 6 at ¶ 38, and attached Statement of FCC Chairman Tom Wheeler ("In Tennessee and North Carolina, and in 17 other states, community broadband efforts have been blocked or severely curtailed by restrictive state laws—laws often passed due to heavy lobbying support by incumbent broadband providers"); T. O'Boyle and C. Mitchell, *The Empire Lobbies Back: How Big Cable Killed Competition in North Carolina*, Institute for Local Self Reliance (January 2013) (available at: http://ilsr.org/wp-content/uploads/2013/01/nc-killing-competition.pdf).   Intense lobbying says nothing about the wisdom of a particular piece of legislation. *See, e.g.,* D. Leinwand and E. Bazar, Walsh's Murder Had Impact Across State, USA Today (December 17, 2008) ("Influenced by the Walsh case and intense lobbying by the child's parents, Congress passes the Missing Children Act") (available at: http://usatoday30.usatoday.com/news/nation/2008-12-17-walshinside_N.htm).

[140]   *C.f. Nixon v. Missouri Municipal League, et al.,* 541 U.S. 125 (2004).

[141]   In the presence of a negative externality (pollution), competitive markets produce too much. In the presence of a positive externality, competitive markets produce too little.

the externality problem and compare it to the addition of a firm to a market already in equilibrium.

As noted above, to incorporate the external effects into the analysis, an additional term appears in the consumer welfare function:

$$W(N) = \tfrac{1}{2}(A^2 - P_e^{\,2}) - Nf + zQ_e,\tag{12}$$

where z is the value of the external effect ($z > 0$) per unit consumed (Q_e). To make the case that a subsidized government-owned firm is the proper response to the positive externalities requires that the additional positive term in the welfare function is sufficiently large to make the socially-optimal number of firms greater than the private long-run equilibrium. This argument, however, rests upon the extremely strong assumption that the only available tool to increase aggregate quantity is an increase in the number of firms in the market, and to do so in a way that only the government is willing to be that firm. As noted above, what we need for broadband is more quantity, not more firms.

Rarely is it the case that the number of firms in the market is the only available tool. For example, various types of consumer subsidies can be utilized to achieve the same outcome in a far more efficient manner than the entry of a new firm.[142] As noted in one article about municipal broadband, "[l]ocal and state governments generally are not interested in operating broadband systems; most prefer to provide regulatory and financial incentives for private-sector carriers to make the necessary investments."[143]

To illustrate this point, consider a straightforward numerical example. Going back to the economic model, suppose that $A = 36$ and $f = \$144$ so that the long-run equilibrium number of private firms is $N^* = 2$. The private long-run equilibrium would have an aggregate quantity of $Q_e = 24$. Suppose that this level is too small from a societal point of view due to a positive external effect associated with broadband. If a municipal firm enters ($N = 3$), then the competitive effect would increase the aggregate quantity by three units (up to 27). There would, however, be the additional societal burden of another 144 units of fixed costs.

The predatory nature of additional entry can be seen here (though I have not specifically modeled the subsidization of the firm to induce entry). With three firms, each of the firms would sell 9 units at a price of $9, resulting in revenue of $81 compared to their fixed investment of $144. Prices are below incremental cost.

As an alternative to entry, suppose we attempted to generate the same three-unit increase in aggregate quantity by a uniform consumption subsidy of s per unit. Hence, the demand curve would now be

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[142]   Governments may also eliminate taxes and other regulations and procedures that discourage private sector investments.

[143]   *Why States Should Support Broadband*, *supra* n. 79.

$$P = A - Q + s . \tag{13}$$

With two firms in the market, the size of the subsidy required to generate the three-unit increase in the aggregate quantity would be s = \$4.50. The total cost of the subsidy would be \$4.50 × 27= \$121.50. Clearly, this is less than the fixed costs associated with setting up a municipal firm (\$144). Furthermore, the two incumbent firms would cover their average total costs and profits would be positive. The firms would each have revenue of \$13.50 × 13.50 = \$182.25 versus a fixed investment of \$144. There would be no issues of predation or potential exit. Moreover, the profits could even be extracted via a lump sum tax to pay partially for the subsidy if necessary.[144]

In this example, I have shown that a simple uniform subsidy dominated the alternative of the entry of an additional competitor even though a uniform subsidy is not the most efficient type of subsidy that can be used to increase the aggregate quantity. A subsidy targeted to those consumers with a lower willingness to pay (broadband vouchers) would be even more efficient than a uniform subsidy since there is no benefit to subsidizing those that are already consuming the service in the private equilibrium.[145] Even in cases where substantial upgrades are required, some targeting may be possible, reducing the social cost of obtaining the positive externalities. Some private companies are presently active in such programs (without subsidies), including Comcast's *Internet Essentials* program (providing low-cost broadband and computers to low-income households)[146] and Facebook's *Free Basics* program (offering free but somewhat limited Internet access in developing economies).[147]

Furthermore, subsidies are a continuous instrument that can be easily adjusted in magnitude and targeted to particular groups to achieve the desired increase in quantity. The addition of a firm, by contrast, is a discrete (and inefficient) instrument that only provides a very imprecise targeting of desired increases in market quantity. In our example, if the socially optimal quantity was really 26 units, then the use of firm entry could not hit the target but must either miss it on the low side with two firms (24 units) or miss it on the high side with three firms (27 units). The subsidy, however, could easily achieve the optimal 26 units by adjusting the size of the uniform subsidy down to 3 units.

Without doubt, the best argument for municipal broadband is the positive externalities obtained from broadband. Yet, as I show here, entry with a high fixed-cost technology is a terribly costly and clumsy way to increase quantity to obtain a externality. It is also, by any standard, a radical and controversial approach. Theoretically, subsidies to existing firms and/or households is a far more efficient way to increase adoption and investment. Such subsidies avoid the controversy surrounding municipal broadband and do not lead to below-cost (predatory) pricing. For the city, practical problems implementing a subsidy

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[144] Economic theory indicates that lump-sum taxes are the most efficient form of taxation. Such a tax would not fully pay for the full cost of the subsidy.

[145] In the same way, there is no benefit from offering households a quality of broadband that they couldn't possibly use (*e.g.,* 1 Gbps). Targeted deployments may be more sensible.

[146] *See* https://internetessentials.com.

[147] *See* https://www.internet.org.

scheme and the failure of the FCC to have any meaningful plan (other than passing the buck to municipalities to take on highly risky projects) may move municipal entry up the list of potential remedies, but entry is not pro-competitive but decidedly anticompetitive. In fact, municipal broadband makes far more sense if competition is not the goal.

VII. Practical Considerations for Reasonable Policy

Broadband is valuable and it is believed to have value above and beyond private values alone. As such, the private incentives to deploy and adopt broadband are too low. What is needed, consequently, are policies that encourage an increase in the deployment of modern broadband networks and the adoption of the services offered over those networks. *We have a quantity problem* (where quantity may be considered in terms of bandwidth as well), *not a competition problem*. Competition cannot solve a positive externalities problem—the private incentives are never enough. Again, we don't need more providers, we need higher quantities.

Forcing an additional provider into a market—especially a government-owned and highly-subsidized one—is a very poor and untargeted policy to deal with a quantity shortage. This option is better characterized as anticompetitive than it is competitive and may very well lead to a government or private monopoly in broadband. This approach to solving the broadband externality issue may have its advocates, but experience suggests the cracks in it will eventually begin to show (and already are). Subsidies may very well be necessary to address the externality, but it is hard to find rational, economic support for the asymmetric subsidization of a government-owned broadband network intent on "competing" with existing private-sector firms.

Not only are the economics of municipal broadband questionable, but the risks are great. In the vacuum created by the failure of federal policy for broadband deployment in marginal communities, more and more cities are contemplating the construction of networks, placing themselves at great financial and possibly even litigation risk.[148] A few examples of the downsides of municipal systems may be helpful in understanding the nature of the problem.

A. *Burlington, Vermont*

One of the first municipal fiber projects was in Burlington-Vermont. The City elders, confident in their business plan, promised taxpayers that the broadband network would be "financially self-supporting, pay all of its own cost, and yield a return to the City budget."[149] Municipal broadband advocates took them at their word, and praised the Burlington project an example where "[c]ommunities can build a telecommunications

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[148] A recent document from the White House, *Broadband Opportunities Council*, *supra* n. 4, offers a few and quite general recommendations on how to improve federal policy with respect to broadband deployment.

[149] City of Burlington Vermont 2007 Annual Report at p. 62 (available at: https://www.burlingtonvt.gov/sites/default/files/Mayor/AnnualReports/2007/burlington_vermont_fy2007_annual_report.pdf).

network to provide better services at a lower cost while raising revenue."[150] Despite such potential, exercising a bit of Yankee sensibility the Vermont legislature passed a law which forbade the City of Burlington from providing any financial support to the fledgling telecommunications network. While the legislature was pleased to see the project go forward, their intention was clear: the taxpayers will not be on the hook in the event of bad times.[151] The legislature's concerns were prescient.

Soon after the project got underway, reports of mismanagement began to percolate. In response, the Vermont Public Service Board ("PSB") launched an investigation into Burlington Telecom, and its findings were staggering. Among other problems (including failing to meet buildout requirements), the PSB found that not only had the City had improperly advanced funds to keep the network afloat from the City's general cash pool, but that Burlington Telecom had failed to pay the money back to the treasury, leaving the taxpayers on the hook for $16.9 million—conduct, by the way, which Burlington Telecom freely admitted to. In the PSB's view, "the City's admitted conduct displayed a *wanton disregard* not only for a significant condition of the network's [certificate of public good], but also for provisions of the city charter that were enacted by the state legislature specifically to prevent such conduct."[152]

Burlington countered that the advance was no big deal, because the cash pool was the "City's bank account" in which the "majority of the City's funds are comingled." The PSB didn't buy this argument, finding that the "distinction that Burlington Telecom is seeking to make between city money and taxpayer money is largely immaterial." As the PSB observed:

> It was clearly the legislative intent to avoid having the residents of Burlington saddled with a debt resulting from a failed venture. It would undermine this intent to accept the argument that dollars may be contributed by the City to BT from parking receipts, sales tax, license fees, or whatever, but not from the property tax. Dollars are the ultimate fungible, and have no identity as to their source. Even were that not the case, clearly, a dollar (or a million dollars) removed from the City's checking account leaves a hole that must be filled from somewhere, and the residual source is the property tax.[153]

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[150]   *See* http://www.leg.state.vt.us/DOCS/2000/bills/passed/h-856.htm.

[151]   *See, e.g.*, C. Mitchell, *Burlington Telecom Case Study*, Institute for Local Self-Reliance (August 2007) at p. 5 (available at: http://ilsr.org/wp-content/uploads/files/bt.pdf).

[152]   State Of Vermont Public Service Board, Docket No. 7044, *Petition of City of Burlington, d/b/a Burlington Telecom, for a certificate of public good to operate a cable television system in the City of Burlington, Vermont (In Re: Amended Petition to amend Condition No. 17 of CPG related to completion of system build-out and to grant temporary relief from limitation in Condition No. 60 of CPG on financing operations,* ORDER ON MOTIONS AND CROSS-MOTION FOR PARTIAL SUMMARY JUDGMENT (Order entered: 10/8/2010) (emphasis supplied).

[153]   *Id.* at p. 15

The PSB concluded that "Burlington Telecom now owes the cash pool $16.9 million with no immediate or probable prospects of full repayment by Burlington Telecom. This now leaves City taxpayers effectively bearing the burden of this $16.9 million in Burlington Telecom losses."[154]

But this is not the end of this story: Burlington Telecom was subsequently sued by a major vendor for $33 million for defaulting on an equipment lease. This case was recently settled for $10 million, forcing the private sector to absorb the loss.[155] To help finance this settlement, in November 2014 the City of Burlington entered into a sale/leaseback arrangement with a local businessman, effectively privatizing what was once a poster child of municipal broadband.[156]

B. *Provo, Utah*

City officials in Provo, Utah, began constructing a municipal broadband network in 2004. Provo's business plan was to forge partnerships with various Internet Service Providers ("ISPs") under which Provo would own and operate the network while the ISPs would sell the service to the end consumer. To pay for the network, the city issued $39 million in bonds, committing to monthly payments of $278,000 for 20 years. Over time, most of the ISPs on the network were unprofitable and the network eventually went bust. In 2008, Provo sold the network to the one remaining ISP on the network, but it too could not sustain financial viability. Eventually, the network reverted back to Provo.[157]

As a stop-gap measure, city officials in November 2011 began charging $5.35 a month on residents' electric bills to pay the bond payment (an explicit cross subsidy).[158] Finally, in 2013, the City of Provo sold the network to Google for $1 in exchange for providing a free basic 5 Mbps service to all Provo residents for seven years (a below-cost price under nearly any measure of cost), as well as offering a free gigabit service to 25 public institutions, including public schools and recreation centers.[159] It's hard to compete with

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[154] *Id.* at p. 16. It should be noted that given such chicanery, the FBI also investigated whether the City of Burlington had violated Federal law. *See Vt. Officials Say FBI on Burlington Telecom Case,* ASSOCIATED PRESS (December 1, 2010) (available at: http://www.boston.com/news/local/vermont/articles/2010/12/01/vt_officials_say_fbi_on_burlington_telecom_case).

[155] *See* R. Estabrook, *City Council Approves Burlington Telecom Settlement*, WPTZ News (November 17, 2014) (available at: http://www.wptz.com/news/city-council-approves-burlington-telecom-settlement/29788148).

[156] J.B. Baird, *State OKs Burlington Telecom Sale, Lease*, BURLINGTON FREE PRESS (November 3, 2014) (available at: http://www.burlingtonfreepress.com/story/news/local/2014/11/03/state-oks-burlington-telecom-sale-lease/18432671).

[157] V. Horiuchi, *Provo Googled its Way Out of Fiber-Optic Network But Costs Live On,* SALT LAKE TRIBUNE (June 3, 2013).

[158] *Id.*

[159] V. Horiuchi, *Council Approves iProvo Sale to Google*, SALT LAKE TRIBUNE (April 24, 2013).

free, and the loss of public customers certainly hurt the financial prospects for private providers.

Provo taxpayers were left holding the bag, forced to pay off a $39 million bond that the city originally issued to build the network. With interest, taxpayers still have to pay $3.3 million in bond payments per year for the next 12 years. And on top of that, the city will have to front an additional $1.7 million to cover costs not assumed by Google. These additional costs include (a) $722,000 for equipment in order to continue using the gigabit service for government operations already using the network, such as the operation of traffic lights and police and fire services; (b) $500,000 to a civil engineering firm to determine exactly where the fiber optic cables are buried because the construction company originally retained by the city to install the fiber cables underground did not keep records of where they buried all of them; and (c) $500,000 for an insurance policy to help mitigate any possible legal damages should Provo's network not be presented to Google as promised.[160] Finally, if things don't work out for Google, it was reported that the city has to buy-back the network for $1.[161]

C. *Tacoma, Washington*

In 1997, the city of Tacoma-Washington approved a plan to build a municipal communications network for a cost of about $200 million.[162] Ushered in with great fanfare, the project earned Tacoma the nickname of the "America's most wired city."[163] Like other municipal ventures, the Tacoma system received high praise for its benefits:

> Since its approval in 1997, Tacoma's hybrid fiber coaxial network has, among other things, ushered in a cable television service, offered customers three high-speed retail Internet service providers, enhanced Tacoma Power's electrical system and created a communications network among government institutions. In turn, the network and its programs have drastically reduced market rates for cable TV and Internet subscribers; saved local governments about $700,000 in annual expenses; and created several promising projects, such as "smart meters" that can gauge utility consumption electronically and "pay as you go" account options for electricity customers ...[164]

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[160] *Id.*

[161] D. Smith, *Google Fiber in Utah: Why Provo Sold its $39 Million Internet Service to Google for Just $1,* INTERNATIONAL BUSINESS TIMES (April 19, 2013).

[162] HISTORY LINK FILE # 5140: *Tacoma City Council Approves Click! Network on April 8, 1997* (available at: http://www.historylink.org/index.cfm?DisplayPage=output.cfm&file_id=5149); K. Martin; *How to Stop Click from Bleeding Money? Tacoma Looks at Option,* THE NEWS TRIBUNE (June 27, 2015) (available at: http://www.thenewstribune.com/news/local/politics-government/article26354104.html).

[163] M. Halverson, *Disbanded, supra* n. 29.

[164] C. Mitchell, *Tacoma Offering Tips to Seattle*, MUNINETWORKS.ORG (September 19, 2010) (available at: http://muninetworks.org/content/tacoma-offering-tips-seattle).

Unfortunately, as with many municipal projects, economic reality finally met up with the hype: Tacoma's municipal network is hemorrhaging $7.6 million a year, it is projected to lose $38 million over the next ten years, and it has yet to pay back off the original investment.[165] The utility recently concluded that "Tacoma Power doesn't need a wired telecommunications network for metering."[166]

The massive financial losses fall to the municipal electric company's captive ratepayers—regardless of whether they buy broadband or not—who must provide an annual subsidy to the failing broadband network to the tune of about $8-9 million a year.[167] For the consumer, this cross subsidy is no small matter. According to local press reports, this subsidy represents 2.5% - 3% of a customer's electric bill, so for a typically customer the subsidy costs them about $3.20 to $3.84 on a $128 monthly bill.[168]

The citizens of Tacoma are fed up: according to a recent poll, seven of ten captive ratepayers said they would rather see the municipal network shut down than have power customers or the city government provide any additional subsidies.[169] This sentiment is important—what constituents are willing to pay for the alleged "positive externalities" of broadband. Given this financial situation, the fact that a senior official from Tacoma's mayor's office conceded that the "utility would not make the same decision today."[170] At present, the city is contemplating its strategy for the future, including a lease of the system to a private provider.[171]

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[165] *How to Stop Click From Bleeding, supra* n. 162; *A New Era Needs a New Plan for Tacoma's Click Cable TV (Opinion)*, BELLINGHAM HERALD (November 7, 2014) (available at: http://www.bellinghamherald.com/opinion/article22256331.html).

[166] *An In-Depth Look at Click! Financials, supra* n. 119.

[167] K. Martin, *Proposal to Lease Click Network to Private Company Leaves Tacoma Leaders Uneasy*, THE NEWS TRIBUNE (March 31, 2015) (available at: http://www.thenewstribune.com/news/local/politics-government/article26273497.html)

[168] K. Martin, *Poll Results Differ from Public Feedback on Potential Click Lease*, THE NEWS TRIBUNE (June 18, 2015) (available at: http://www.thenewstribune.com/news/local/politics-government/article26337643.html).

[169] *Id.* Not surprisingly, many attendants at the public meeting opposed the lease of the system, but this group was not representative of the population ("'It's safe to say a majority of the speakers (at the public meetings) said they did not support the Wave proposal,' said Bob Mack, TPU deputy director for public affairs. 'Not very many expressed concerns about Click's financial distress.' Mack said that's likely because many who attended the meetings have a financial interest in the outcome of the lease discussions and want to defend the status quo. This group includes Click employees and their family members, as well as owners or employees of the companies that sell Internet service on Click's wires.").

[170] M. Halverson, *Disbanded, supra* n. 29.

[171] *Presentation to the Tacoma City Council and Public Utility Board - Options for Click*, Tacoma Public Utilities (September 1, 2015)(available at: http://www.clickcabletv.com/file_viewer.php?id=2003); C. Nehls, *Tacoma Council Asks Public Utility to Investigate Municipal Broadband Service*, FIERCECITIES.COM (December 17, 2015) (available at: http://www.fiercecities.com/story/tacoma-council-asks-public-utility-investigate-municipal-broadband-service/2015-12-17).

D. *Groton, Connecticut*

Success isn't guaranteed even in markets where a municipal electric utility builds a broadband network. Consider the case of Groton-Connecticut. Groton Utilities is a municipal utility offering electricity services. The city decided to build a modern cable, telephone, and broadband network to compete with Comcast.[172] The city borrowed $27.5 million to build the network. After incurring $11 million in losses from the operation of the network, the city found itself subsidizing the operating expenses of the company at a cost of about $2.5 million a year. Significantly, bankruptcy was not an option; the broadband operation is part of Groton Utilities and the utility is a city department, so the broadband division could not declare bankruptcy unless the city itself declared bankruptcy. Still, the city wanted out of the broadband business.

Eventually, the broadband network was sold to a private investor for $550,000. The initial agreed upon selling price to the sole interested party was $150,000, but some finagling got the price up a bit. Now, the $38 million tally of debt and losses is being passed on to the city's captive electric ratepayers.

When advocates promote municipal broadband, they don't talk about Groton, Provo, Tacoma, Burlington, or any one of the many financial failures leaving taxpayers holding the bag. Neither the FCC nor the White House mention Groton in their advocacy pieces for municipal broadband, but these financial disasters (among others) are surely part of the story. There is the strong stench of dishonesty in the government's advocacy. Instead, advocates point to highly-subsidized systems like Chattanooga (replacing the failed Burlington system as poster children), since the illusion of success remains intact. Cities contemplating broadband networks must, however, weigh the totality of the evidence. All the evidence should be front and center in the policy debate. The need for broadband is real, but there are no simple solutions where broadband service is absent or lacking. There are good reasons why the service is absent or lacking, and those reasons must be overcome in one way or another.

VIII. Conclusion

Promoting the rapid deployment of broadband to all Americans, as Section 706 of the Telecommunications Act commands, is seen by many to be a worthy social goal. Yet, universal availability of broadband service is not to be expected from purely private investment. Municipal broadband may make a positive contribution towards closing the availability gap, and economic theory suggests that offering broadband service to the unserved is claimed to bring with it sizeable payoffs. A topic of perhaps greater interest is what economics has to say about using municipal broadband to fill this gap by

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[172] G. Smith, *Groton's Deal to Shed TVC Finalized as New Owners Take the Reins*, THEDAY.COM CONNECTICUT (February 1, 2013) (available at: http://www.theday.com/article/20130201/NWS01/130209982); D. Straszheim, *How a Promising Idea Went Terribly Wrong in Groton*, GROTON PATCH (January 6, 2013) (available at: http://groton.patch.com/groups/politics-and-elections/p/how-a-promising-idea-went-horribly-wrong-in-groton); Groton Utilities (available at: http://www.grotonutilities.com).

"promoting competition" in broadband markets. In this paper, I've analyzed this very topic and offer the following findings:

- First, the social benefits of broadband accrue neither to broadband providers nor their consumers, but to a third party. Thus, broadband policy is motivated by a positive externality. As a consequence, the private incentives of consumers to pay for and the private incentives of firms to deploy the "right amount" of broadband are *too low* from a social perspective. Competition is not a solution to the externality problem. Externalities are dealt with by using subsidies to alter private incentives so that they coincide with the social perspective.

- Second, municipal broadband is incapable of increasing in the long run the number of firms offering service in a given area. The number of providers in a market is determined by economic forces, not the whims of federal, state or city politicians. Municipal entry will eventually lead to the exit of the public or private providers, or both.

- Third, as the evidence suggest, economic theory indicates that municipal broadband is in almost all scenarios subsidized entry. The point is hardly debatable.

- Fourth, and following from the prior finding, subsidized municipal entry is prone to be predatory. Municipalities operating broadband networks are not, as the Supreme Court observed, acting only "to serve the public weal." Instead, municipal entry is specifically targeted at capturing market share from private sector providers. As such, the subsidized entry of a municipal system may be characterized as anticompetitive in nature.

- Fifth, while municipal entry will almost certainly induce private firm exit, it is also true that the mere threat of municipal entry can reduce private sector investment. Paradoxically, the resulting lack of private supply may then be used to justify the municipal entry that caused the lack of competition in the first place.

- Sixth, for a number of reasons, the consumer welfare implications of municipal broadband are almost certainly unfavorable. The dependence on subsidies is problematic because subsidy dollars are expensive; research suggests that every dollar of spending by government costs way more than a dollar to gather and distribute. Also, free entry into a market typically leads to excessive, not too little, entry. In broadband, while an additional firm may lower price, that lower price must be paid for by the high-cost of building a new network. It's often not worth it to society, even if it's worth it to the firm (or municipality).

- Seventh, a shift to the more accurate "externality" motivation for municipal broadband is very informative. Incurring the massive fixed and sunk costs of building a broadband network, especially with subsidy dollars, is a very inefficient way to obtain the external benefits. Additional entry above and beyond the private sector equilibrium likely reduces consumer welfare and inevitably must induce exit by either the public or private firm(s). Subsidies to existing firms to increase output to achieve externalities are, under almost all circumstances, a better policy.

Subsidies are continuous and can be fine-tuned and targeted—entry is a discrete, clumsy, untargeted, and expensive approach.

- Eighth, given the above, the control by state legislatures of their municipal subdivisions with respect to municipal broadband has strong economic support.

- Finally, broadband is economically important, but much of the economic gains attributed to municipal broadband systems are based on economic migration rather than economic development. Business stealing is not a sustainable policy; a first mover advantage is not available to late comers. Newer and proposed deployments of municipal systems will not see as much economic return to broadband as earlier deployments.

When seen through the lens of a rational economic framework, municipal broadband is shown not to be a legitimate or even meaningful way to "promote competition." If anything, economics tells us that municipal broadband is anticompetitive. The pursuit of positive externalities has more promise as a justification for municipal broadband, but even then there are potentially more efficient and less controversial alternatives to capture those externalities than by incurring the enormous cost of duplicating networks in communities where private-sector firms already offer some services.

Despite attacks by the federal government, state laws that govern the terms of municipal entry have a solid economic foundation. In contrast, as shown here, the Federal Communications Commission's current position that municipal broadband promotes competition in any normal sense of the term has no foundation at all, at least it can't be found in economic theory. Continued oversight of municipal entry by state legislatures is legitimate if they choose to do so.

Rejecting competition as a motivation for municipal broadband is not a rejection of municipal broadband. Certainly, in markets where no broadband exists, a municipality may sensibly construct and subsidize (perhaps indefinitely) a broadband network if it feels the externalities are large enough to justify it. In markets where private firms already offer some level of service, there may be more efficient and less controversial ways to obtain such external benefits.[173] Practical considerations must be considered, however. Today, there appears to be no plan by the federal government to aid municipalities in enticing private firms to expand services. City officials may feel their hands are tied, forcing them into less desirable solutions. In the long term, municipal broadband advocacy will be better served by focusing attention on the real issue of externalities rather than the mistaken claims about increasing competition.

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[173] For a range of options not including the reform of federal subsidy programs, *see, e.g., A Broadband Policy Agenda From Next Century Cities*, BROADBAND COMMUNITIES (August/September 2015) (available at: http://www.bbcmag.com/2015mags/Aug_Sep/BBC_Aug15_NextCenturyCities.pdf), which summarizes *Connecting 21st Century Communities: A Policy Agenda for Broadband Stakeholders*, Next Century Cities (July 2015) (available at: http://nextcenturycities.org/wp-wp-content/uploads/2015/07/NCCPolicyAgenda_Web.pdf).

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