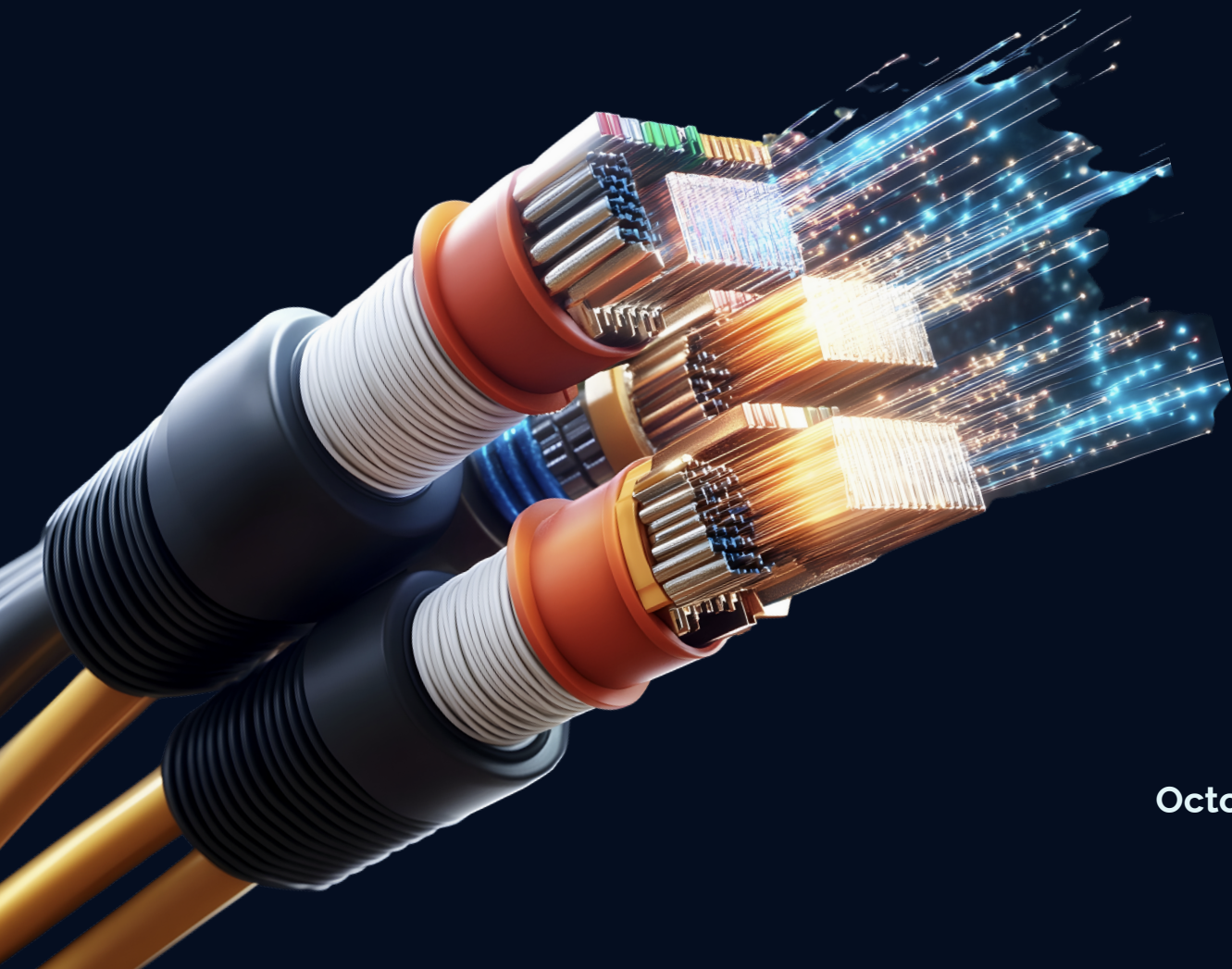


Telecom Advisory Services

ASSESSMENT OF THE ECONOMIC IMPACT OF **TAXATION ON COMMUNICATIONS INVESTMENT IN THE UNITED STATES (2019-2024)**

Report to the Broadband Tax Institute



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Telecom Advisory Services LLC (URL: www.teleadvs.com) is a consulting firm registered in the state of New York (US) with physical presence in New York, Madrid, Vienna, Mexico City, Buenos Aires, Bogota, and Quito. Founded in 2006, the firm provides advisory and consulting services internationally, specializing in the development of business and public policy strategies in the telecommunications and digital sectors. Its clients include telecommunications operators, electronic equipment manufacturers, Internet platforms, software developers, as well as the governments and regulators of countries such as Germany, United Arab Emirates, Kingdom of Saudi Arabia, Argentina, Chile, Colombia, Ecuador, Costa Rica, Mexico, and Peru. The firm has also conducted numerous economic impact and planning studies of digital technologies for the GSMA, NCTA (USA), Giga Europe, CTIA (USA), the Dynamic Spectrum Alliance, and the Wi-Fi Alliance. Among international organizations, the firm has worked for the International Telecommunication Union, the World Bank, the Asian Development Bank, the Inter-American Development Bank, the World Intellectual Property Organization, the UN Economic Commission for Latin America and the Caribbean, CAF Latin American Development Bank, and the World Economic Forum.

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EXECUTIVE SUMMARY

This study examines the impact of sales taxes on the purchase and use of communications equipment on the capital investment of telecommunications and cable industry operators. Supported by extensive research documenting the evidence that taxes tend to raise the required pre-tax rate of return of capital invested and to negatively affect the incentives of a company to make capital investments, the study presents a set of robust econometric models designed to specifically quantify the relationship between state-level sales tax rates applied to communications equipment and the investment behavior of telecommunications and cable companies in the United States. The objective is to empirically test the central hypothesis of this study: that higher taxes on communications equipment lead to a measurable and statistically significant reduction in network investment.

This study is the third iteration of this type. In the first study, according to econometric models developed with data for all states between 2006 and 2010, a decrease of 1 percentage point in the average weighted state and local sales tax rate affecting initial equipment purchases would increase investment by up to 0.80%. In the second study, with similar data between 2006 and 2018, a decrease of 1 percentage point in the average weighted state and local sales tax rate would increase investment by 1.97%. Finally, in the current iteration conducted with panel data for all states between 2019 and 2024, a decrease of 1 percentage point in the average weighted state and local sales tax rate affecting initial equipment purchases is associated with an investment increase of 2.11%. In other words, the positive impact of sales taxes exemptions on communications investment has been consistently increasing with each iteration of this study. As the demand for high-bandwidth services and modernization pressures intensify, the marginal return to tax-induced investment rises (via learning-by-doing, network effects, and reduced adjustment frictions), so a one-point tax reduction now unlocks proportionally more shovel-ready projects, raising the reinvestment elasticity.

At the same time the negative impact of taxation on network investment has increased, the average sales tax rate has also been increasing. In 2006, when this issue was first examined, the simple average tax rate across States was 4.01%. In 2010 the average sales tax rate of the States that collected levies was 4.22%, while in 2018 the average rate reached 4.40%. Finally, while the total average tax rate in 2024 was 4.07%, a more precise measure that accounts for the varying levels of investment across states—the weighted average tax rate—reached 5.12%, a figure that more accurately reflects the actual tax burden on network investment nationwide.¹

According to the econometric models developed with state panel data between 2019 and 2024, a decrease of 1 percentage point in the average weighted state and local sales tax rate affecting initial equipment purchases (for example, from 5.12% to 4.12%) would increase investment by \$745 million² over the current level of \$51.15 billion (\$35.41 billion if we only consider the taxable investment in communications equipment).

¹ This weighted average is the key metric used for the impact analysis throughout this report. See Appendix B for a weighted average calculation.

² These estimates represent a baseline, since a rise in non-taxable investment would probably be matched by a similar increase in taxable investment.

A scenario where the states with sales tax on communications equipment join those states that have eliminated these taxes to promote network deployment yields an important capital investment growth. Under this scenario, we estimate an additional investment in communications equipment of \$3.82 billion (an increase of 7.47% over the current level), reaching a total investment of \$54.97 billion in the first year, with a similar effect remaining over time. Alternatively, under a scenario where the average rate was reduced by 41.41% (from 5.12% to 3.00%), the increase in investment would be \$1.58 billion in the first year, and similar impact over time (an increase of 3.09% over the 2024 level).

Research indicates that the economic benefits associated with investment in communications networks are broadly distributed. By relying on input-output analysis, an increase in investment of \$3.82 billion in one year (sales tax elimination scenario) will translate into the following economic contributions:

- \$8.93 billion in additional annual output after the increase in investment driven by broadband network construction.
- 27,400 jobs/year after the increase in investment (although given the full employment context, these could be created in other sectors or through new entrants to the job market)³.

The sum total of the economic effects is presented in Table A.

Table A. Economic effects of eliminating the Sales Tax on Network Equipment

Incremental Investment (\$ Billions)	Direct Effects		Indirect and induced Effects ⁴		Total Effects	
	Incremental Output (\$ billions)	Jobs (*)	Incremental Output (\$ billions)	Jobs (*)	Incremental Output (\$ billions)	Jobs (*)
\$3.82	\$3.82	12,463	\$5.11	14,968	\$8.93	27,431

(*) Measured in jobs year

Source: Telecom Advisory services analysis

These “construction” effects attributed to additional deployment will manifest themselves every year if the tax exemption is preserved.

Furthermore, given fixed broadband’s high adoption level in the United States (84.49%)⁵, the spillover impact of additional investment comprises two effects:

³ Employment effects follow the definition of the Bureau of Labor Statistics Census of Employment and Wages (BLS CEW) data, which standardizes all employment into a full-time year-long equivalent.

⁴ Indirect effects refer to output and jobs generated by the purchase of intermediate inputs in network deployment, while induced effects covers the acquisition of goods and services triggered by the additionally employed persons.

⁵ The FCC reports that as of June 30, 2024, fixed lines of at least 25 Mbps download and 3 Mbps upload represented 111.71 million (FCC. Industry Analysis Division (2025). Internet Access Services: Status as of June 30, 2024), The Bureau of Labor Statistics reported that in June 2024 the total number of U.S. households was 132.216 million.

- **Contribution to a reduction of the digital divide:** the estimated increase of 617,000 lines of at least 10 Mbps represents the adoption of households that did not have a broadband connection or had a line under 10 Mbps (an increase of 0.5% in total lines of the US). The economic impact of an increase of 617,000 new adopters can be estimated by relying on the GDP elasticity coefficient of new broadband lines calculated in prior research conducted for the International Telecommunications Union (Katz, 2025). Based on a coefficient of 0.142 for high income countries, this 0.5% increase in total lines is projected to conservatively contribute an additional \$21 billion⁶ to the national GDP, representing the productivity and economic activity gains from these new connections.
- **Upgrade of broadband speed tiers:** This entails two parallel effects: (i) a portion of households acquiring service under the 2015 FCC standard of 25 Mbps download/3 Mbps upload migrate to this service tier; (ii) a portion of households acquiring service under the March 2024 FCC standard of 100 Mbps download/20 Mbps upload migrate to this service level (these includes users acquiring broadband at all service levels although they are more likely to be those acquiring service at 50 Mbps download levels). The complete elimination of the sales tax is projected to spur more than 1.1 million households in high-adoption states to upgrade to services of at least 100 Mbps, with over 940,000 adopting speeds of at least 25 Mbps. Regarding the impact of the economic increase in higher speed of service lines, while the available FCC data allows for the estimation of the number of households migrating to higher service tiers, it does not provide the granularity needed to determine the precise average increase in speed for these upgrading customers and consequently estimate their return to speed.

These two effects would take place in one year, although it is plausible to consider that if the tax exemption were to be extended beyond the first year, additional effects would materialize. Both effects are critical in light of the efforts currently implemented by federal and state governments to bridge the digital divide and increase high quality broadband connectivity. Finally, the new economic activity will generate substantial offsetting revenues for state and local governments as new economic activity generates income, sales, property, and other tax revenue for governments.

In particular, the economic contribution from the elimination of the sales tax on communications equipment purchase will be critical within each state economy, as demonstrated in a model that includes data on all states, and in a number of specific state case studies (Florida, Georgia, Kentucky, Louisiana, Oklahoma, Tennessee, Texas, and Wisconsin). It should be noted that in the case of Tennessee, since the tax moratorium took effect, operators have reported a clear reduction in equipment costs which translated into higher CAPEX, accelerated build schedules, and the advancement of projects that were previously marginal. In fact, in the years following the moratorium, Tennessee's deployment and investment growth rate was nearly three times the national average, underscoring the policy's outsized impact. The analysis estimates that the elimination of the equipment sales tax resulted in an increase of capital investment of 10.44% in the long run, which should remain constant while this measure stays in effect.

⁶ GDP impact (lower bound): \$21B; the model omits the speed effect above 10 Mbps.

Table B. Economic effects of eliminating the sales tax on network equipment in specific States

Economic Indicators	Florida		Georgia	
	Current	First Year	Current	First Year
GDP per capita	\$72,974	\$72,990	\$78,932	\$78,956
Incremental GDP (\$M)	-	\$378	-	\$266
Incremental Output (\$M)	-	\$735	-	\$517
Incremental Jobs Year	-	2,260	-	1,589
Broadband >10 Mbps	8,708,000	8,828,646	3,755,000	3,797,508
Broadband >25 Mbps	8,552,000	8,736,403	3,629,000	3,692,937
Broadband >100 Mbps	6,181,000	6,412,507	2,822,000	2,908,362

Economic Indicators	Kentucky		Louisiana	
	Current	First Year	Current	First Year
GDP per capita	\$63,862	\$63,878	\$71,292	\$71,317
Incremental GDP (\$M)	-	\$75	-	\$114
Incremental Output (\$M)	-	\$145	-	\$223
Incremental Jobs Year	-	450	-	684
Broadband >10 Mbps	1,585,000	N/A*	1,587,000	N/A*
Broadband >25 Mbps	1,514,000	N/A*	1,517,000	N/A*
Broadband >100 Mbps	923,000	N/A*	882,000	N/A*

Economic Indicators	Oklahoma		Tennessee **	
	Current	First Year	Current	First Year
GDP per capita	\$64,897	\$64,916	-	-
Incremental GDP (\$M)	-	\$78	-	\$133
Incremental Output (\$M)	-	\$152	-	\$259
Incremental Jobs Year	-	467	-	795
Broadband >10 Mbps	1,290,000	N/A*	-	-
Broadband >25 Mbps	1,212,000	N/A*	-	-
Broadband >100 Mbps	831,000	N/A*	-	-

Economic Indicators	Texas		Wisconsin	
	Current	First Year	Current	First Year
GDP per capita	\$86,587	\$86,607	\$75,707	\$75,720
Incremental GDP (\$M)	-	\$609	-	\$80
Incremental Output (\$M)	-	\$1,186	-	\$156
Incremental Jobs Year	-	3,646	-	479
Broadband >10 Mbps	10,301,000	10,336,196	2,185,000	N/A*
Broadband >25 Mbps	10,001,000	10,054,181	2,063,000	N/A*
Broadband >100 Mbps	6,902,000	6,965,752	887,000	N/A*

* The N/A (Not Applicable) notation is used for states where the econometric model did not produce a statistically significant forecast for the increase in broadband connections. However, it is expected that the incremental investment generated by the tax elimination in these states would be directed toward network expansion into unserved and underserved communities, thus contributing directly to closing the digital divide.

**The analysis for Tennessee is a retrospective evaluation based on the state's actual elimination of the sales tax on communications equipment, which occurred in 2022 and 2023. Therefore, the results presented are an estimate of the economic impact that was driven by the tax cut that already happened, rather than a forecast of a potential policy change.

Source: Telecom Advisory services analysis

I. INTRODUCTION

In 2012, Telecom Advisory Services LLC published research that assessed the impact of States sales taxes on the level of investment in communications networks and its economic consequences in the United States⁷. At the time of that study, thirty States and local authorities had imposed a sales tax on wireless and wireline network equipment purchases, and thirty-one states (plus the District of Columbia) had done so on cable network equipment. The evidence in that study concluded that a decrease of 1 percentage point in the average weighted states and local sales tax rate affecting initial communications equipment purchasing (from 4.45% to 3.45% for cable operators and from 4.02% to 3.02% for telecommunications providers) would increase total annual investment in communications networks by \$428 million (1.03% over the 2012 level of \$41.489 billion). The study also estimated the economic spillovers if these levies were eliminated in order to promote broadband network deployment. Such scenario resulted in a baseline estimate of an increase in investment of \$1.78 billion, yielding \$8.69 billion in additional annual Gross Domestic Product (GDP) contribution in the first year after the elimination of the sales tax and \$48.26 billion over three years, resulting in 64,000 new jobs in the first year and 354,000 over three years, and an increase of 712,000 new broadband connections. The publication of the 2012 report served as evidence for the implementation of sales tax exemptions for communications equipment in Texas and Minnesota.⁸ However, after the publication of the 2012 study the total number of states collecting a sales tax on communications equipment purchase increased to thirty-three in telecommunications and thirty-four for the cable industry. Furthermore, while in 2010 the average sales tax rate of the states that collected levies was 4.22%, in 2018 the average rate reached 4.40%. If the rates were prorated by the size of investment by state and sector, the average rate for 2018 would have been 4.58%.

In 2019, Telecom Advisory Services LLC conducted a replication of the 2012 study⁹ and concluded that, based on econometric analysis of panel data between 2006 and 2018, a decrease of 1 percentage point in the average weighted state and local sales tax rate affecting initial equipment purchases (from 4.58% to 3.58%) would increase investment by 1.97% over the level at the time of \$42.93 billion. This would represent an additional investment of \$847 million. This research also indicated that the economic benefits associated with investment in communications networks were broadly distributed. By relying on input-output analysis, the study estimated in 2019 that an increase in investment would translate into \$16.65 billions of cumulative output driven by broadband construction and 70,300 cumulative jobs/year over two years resulting from the same effect. In addition, the investment was estimated to yield an increase in broadband deployment and adoption. It was estimated that the long-term effect on incremental investment resulting from the

⁷ Katz, R., Flores-Roux, E., Callorda, F. (2012). *Assessment of the economic impact of taxation of communication investment in the United States: a report to the Broadband Tax Institute*. October

⁸ In 2013 Texas refunded \$50 million annually which is about 30% of the 6.25% state sales tax paid. In 2014 Minnesota repealed the sales tax but then restored it before the repeal took effect so there was no real impact.

⁹ Katz, R., Callorda, F. (2019). *Assessment of the economic impact of taxation on communications investment in the United States: a report to the Broadband Tax Institute*. November

elimination of the sales tax on communications equipment in those states that had such a levy would yield additional broadband penetration of 0.26% (178,700 additional new broadband connections), over and above the natural growth in broadband lines. The evidence presented in the 2019 study supported the implementation of sales tax exemptions in Tennessee (effective 7/1/2022), Virginia (effective 7/1/2022 for telecommunications, although it already had an exemption for cable), and Kansas (effective 7/1/2024).

Since the publication of the 2019 study, several changes have taken place both in the communications industry and, to some degree, in the network equipment States sales taxation landscape. Wireless, wireline and cable service providers are under considerable pressure to invest in their networks. Broadband Internet traffic has been growing at 15% per year¹⁰, driven in part by the increase in the number of devices that rely on the internet for data transmission (PCs, smartphones, tablets, smart TVs). For example, Park Associates estimated, based on a survey of 8,000 homes, that in 2023 the average U.S. household with internet access had 17 connected devices, including 11 computing and entertainment devices, 4 smart home components, and 2 health devices.¹¹ At the individual level, unique mobile internet users reached 284 million in 2025, increasing from 265 million in 2019¹², and the number of laptops increased to 227 million in 2025 from 190 million in 2019.¹³ In parallel, the usage per device has increased dramatically: In 2025, each smartphone in the United States generated 94.34 GB per month (up from 20.31 GB in 2019). Of this traffic, video represented 43%¹⁴.

The impact of applications adoption on broadband network speed requirements is clear. For instance, a family of five with four computers, three televisions in high definition, two high-definition online games consoles and between 11-20 Wi-Fi connected devices (Alexa, thermostats, smart speakers and the like), would need, at a minimum, a broadband connection of 305 Mbps in download speed and 61 Mbps in upload¹⁵. This represents four times the capacity required for a family of five in 2012: at most, 72 Mbps.

As expected, the growth in Internet traffic has resulted in an increase in fixed broadband speeds. Ookla reports that the average fixed broadband download speed in the United States has been growing from 121 Mbps in 2019 to 349 Mbps in 2025 (or 22% annually).¹⁶ In light of these demand trends, operators in the broadband

¹⁰ The average monthly data usage in 2019 was 344.0 GB and in 2019 was 698.2 GB. Source: OpenVault Broadband Insights Report 4Q24

¹¹ Park Associates (2024). *Average U.S. Internet Home Had 17 Connected Devices in 2023. January 10*. Retrieved in: <https://www.parksassociates.com/blogs/in-the-news/parks-average-us-internet-home-had-17-connected-devices-in-2023>

¹² Source: GSMA Intelligence

¹³ Extrapolated from CISCO Visual Networking Index data.

¹⁴ Source: Ericson. Retrieved in: <https://www.ericsson.com/en/reports-and-papers/mobility-report/dataforecasts/analysis-traffic-profiles>

¹⁵ Source: Broadband Speed Calculator retrieved in: <https://www.thinkbroadband.com/calculator/>, although broadband now estimates that it would require a 1 Gbps connection. Retrieved in: <https://broadbandnow.com/bandwidth-calculator>

¹⁶ Source: Ookla Speedtest Intelligence. Compares the 2019 annual average speed with the average for January-April 2025.

communications industry are increasingly under pressure to accelerate their investment in infrastructure in order to accommodate the growth in traffic and continue delivering quality service.

In addition to continuing the investment in broadband networks to support the ever-growing needs of American broadband users, operators have been pushing, jointly with the federal and state governments, to address the digital divide by deploying new networks or expanding capacity in rural and isolated areas. According to the FCC, by the end of 2019, 21.3 million people resided in areas unserved by broadband services¹⁷. This number decreased to 7.2 million by June of 2024.¹⁸

These two imperatives – continue investing to accommodate traffic growth and deploy networks in unserved areas – put pressure on operators' network spending. Between 2019 and 2024, wireless, wireline and cable operators invested \$335.69 billion in communications networks, and \$51.15 billion in 2024 alone.¹⁹ This trend will not subside, considering the ever-increasing pressure to sustain the required maintenance and capacity upgrade investment, while modernizing networks (through deployment of 5G, FTTH, and DOCSIS 4.0).

In this context, taxation on broadband equipment purchasing, by increasing capital costs, reduces the amount of funds available for broadband deployment. The number of states having put in place a sales tax on communications equipment purchasing has remained fairly stable over the years. As mentioned above, in 2012 thirty states had a sales tax on wireless and wireline equipment purchasing, and thirty-one states (plus the District of Columbia) had one on cable equipment. In 2018, the number of states applying a sales tax on equipment purchasing increased to thirty-three. By 2024, the number of states applying a sales tax on network equipment was thirty for telecommunications operators and thirty-four for cable companies.

The central hypothesis in this study is that States sales taxes on the initial purchase of equipment increase the cost of deploying infrastructure and, consequently, have the potential to reduce the amount of capital geared for deploying communications networks, in particular broadband infrastructure. Since communications have been proven to contribute to economic growth and job creation, a lesser amount of investment caused by sales taxes, would reduce their social and economic impact. In this study we will again provide quantitative evidence of the negative economic impact of taxation of communications equipment purchase. On this basis, we will model what the expected impact would be if the existing levels of taxation were to be reduced or outright eliminated.

In Chapter II we review the research literature regarding the impact of taxation on corporate investment. While emphasizing that a rise in the tax rate in an open economy causes a net capital outflow and negative economic welfare, the research

¹⁷ FCC (2019), *2019 Broadband Deployment Report*, Figure 1, p.16.

¹⁸ FCC (2024). *National Broadband Map*. Available in: <https://broadbandmap.fcc.gov/home>

¹⁹ This amount excludes non network CAPEX, as reported by Charter, Comcast, and Cox (representing 88% of the cable industry), combined with ATT, Lumen, Verizon, and T-Mobile (which accounts in excess of 80% of the telecommunications sector).

also tends to emphasize the complex mechanisms by which taxes tend to affect capital investment in the communications sector. Among the different variables highlighted, we review the varying impact of taxes on investment depending on the state of the economy, the importance of inertia of past capital planning decisions as a driver of future investment decisions, and the competitive impact that taxes might have in attracting future investment from one state to another.

In Chapter III we provide evidence of how taxation has been affecting communications network investment levels since 2019 in the United States. Focusing on sales taxes on initial equipment purchasing by wireline/wireless service providers, and cable, we first review the current situation in terms of the weighted-average state and local sales taxes. On this basis, we develop an econometric model to explain the negative relationship between equipment sales taxes and investment. The third body of evidence we include in this chapter comprises selected case studies based on the analysis of longitudinal data of sales taxes and investment for some of those states that have increased them since 2019.

Having proven the negative relationship between sales taxes on equipment purchasing and investment, we then move to determine the social and economic impact of a potential reduction in taxation. In Chapter IV we review the research literature on the impact of communications networks on economic growth and job creation, underlining both the short-term effects of network deployment and the long-term impact through positive externalities and spill-over effects on the whole economy.

With the review of the literature on economic effects as a background, we present in Chapter V the estimates of alternative scenarios regarding the reduction of sales taxes on network equipment purchasing of the telecommunications and cable industries. The simulations are based on impact models constructed for the national economy, calculating the impact coefficients for economic growth, job creation, and broadband penetration.

Finally, we utilize the econometric models presented in Chapters III and V to estimate what the impact would be if an exemption of state and local sales taxes for communications network equipment purchase were enacted in Florida (Chapter VI), Georgia (Chapter VII), Kentucky (Chapter VIII), Louisiana (Chapter IX), Oklahoma (Chapter X), Tennessee (Chapter XI), Texas (Chapter XII) and Wisconsin (Chapter XIII).

II. EVIDENCE OF THE IMPACT OF TAXATION ON CAPITAL INVESTMENT: A REVIEW OF THE LITERATURE

The most important function of taxes is to raise revenue to finance various government activities, such as the delivery of public goods like education, health, security, and public infrastructure. Taxes are typically collected on both net income and consumption of goods and services. The first type is collected over income generated in a fiscal or a calendar year, while the second one is linked to the acquisition of a good or service (for example, retail sales tax, value-added tax, and import duties)²⁰.

Decisions regarding taxation are driven by public policies guided by normative goals (how much revenue should the state collect to pay for what type of services to be provided to its citizens?) and the cost/benefit equation incurred to meet those objectives. While the benefits of taxes relate to general policies (e.g., raising revenues to support the public administration) or specific objectives (e.g., support the delivery of health care services), economic theory also shows that, in general terms, an increase in taxation affects market equilibrium by shifting the demand and supply curves as a result of raising prices with the consequent reduction in the quantity of goods. Therefore, the impact of taxation in the digital economy needs to be structured around not only the benefits it generates, but also the costs in lost surplus it may imply.

II.1. The impact of taxation on capital investment

The research literature has generated substantial evidence that, since higher taxes tend to raise the required pre-tax rate of return of capital invested, the aggregate capital stock in a given economy depends on the effective tax rate (Slemrod, 1990; Devereux and Freeman, 1995; Jun, 1994; Billington, 1999). As Devereux (2006) states,

“(If a) company should invest up to the point at which the marginal product of capital equals the cost of capital (...) the impact of taxation should be measured by the influence of (an effective marginal tax rate) on the cost of capital.”

Accordingly, when a firm has to make an investment decision, taxation plays a significant role. As stated by Lintner (1954), taxes affect both the incentives of a company to make investments and reduce the supply of funds available to finance them. Thus, not surprisingly, many empirical studies indicate that higher marginal and average tax rates have a negative effect on investment decisions.

In several studies using panel and time-series econometric methods across the United States, OECD countries, and other regions, higher corporate tax measures discourage investment. For example, in a study of United States time series between 1955 and 1985, Feldstein and Jun (1986) report that a 10% cut in corporate and

²⁰ See OECD (2014). *Addressing the tax challenges of the Digital Economy*. Paris.

personal income tax—yielding a 1% net return boost—is associated with a 0.4 percentage point increase in the investment-to-Gross National Product ratio. In a study of statutory and effective corporate tax rates and capital allowances impact on investment in OECD countries between 2003 and 2021 (Hanappi et al., 2023), a report concluded that higher taxes generally deter investment by increasing costs and reducing the return on capital. While recognizing that the impact of taxation differs across firms and policy implementation, a 5-percentage point rise in the effective marginal tax rate corresponds to a decrease in investment of about 1.6% in the long run. Similarly, relying on 1981 to 2001 corporate and personal income tax rates and R&D incentives data for 16 OECD countries, Vartia (2008) estimated long-run elasticities ranging from -0.35 to -1.0 such that a 5-percentage point tax cut may enhance the investment-to-capital ratio by 1–2.6%.

Other studies report that the impact of taxation varies with firm size, sector, financing structure, and the broader economic climate. For instance, dividend imputation appears to stimulate capital investment despite countervailing pressures from capital gains taxes (Black et al., 2000), and one study notes that debt financing can mitigate tax-induced investment declines (Farooq, 2021). In addition, a poor investment climate may render tax cuts less effective at boosting foreign direct investment (Van Parys and James, 2009). Nevertheless, the research indicates that, when tax burdens are reduced or incentives introduced, investment tends to rise—albeit with effects that differ according to economic and firm-specific conditions.

Since investment is one of the engines of long-term economic growth, taxation also plays a role in determining an economy's prospects. Talpos and Vancu (2009) showed that a reduction of corporate income taxation determines, over time, an increase in the level of gross fixed capital formation. The authors also found this effect to be more important in emerging economies, where investment is needed more.

That said, taxes are just one of the many factors driving capital investment decisions. Beatty et al. (1997) show that high net equity financing activity (access to low-cost funds) and high stock returns (market signaling) are also important in explaining high future net capital expenditures. Similarly, as expected, the authors found that high net income and low dividend payouts are important predictors. Nevertheless, when controlling for these factors, the authors also found that changes in the United States tax code in 1986 had a real effect on the investment behavior of US-based firms²¹. In general terms, Lintner (1954) also found that in periods of economic expansion, when taxes are fully borne by firms, the negative impact of taxation on investment affects primarily the supply of funds and not the incentives to invest. Investment may be undertaken to maintain or improve a company's competitive position or to increase market share. Conversely, in periods of economic downturn, the effects of taxes on investment incentives would be relatively more important,

²¹ In 1986, the U.S. Congress passed the Tax Reform Act (TRA) to simplify the income tax code, broaden the tax base and eliminate many tax shelters and other preferences. The act raised overall revenue by \$54.9 billion in the first fiscal year after enactment. As of 2014, the Tax Reform Act of 1986 was the most recent major simplification of the tax code, drastically reducing the number of deductions and the number of tax brackets (for the individual income tax) to three.

and the availability of funds becomes less important in influencing investment decisions.

More specifically, econometric studies examine U.S. capital investment responses to tax-rate changes in different industry sectors. For example, Ohrn (2018) showed that a one-percentage-point reduction in the effective tax rate is associated with a 4.7% rise in capital investment and a 3.7% increase in equity issuance in US manufacturing firms. Similarly, analyses in the energy sector by Metcalf (2009) indicate that higher marginal effective tax rates depress investment, with elasticities ranging from -1 to -2 and the elimination of production tax credits cutting wind power investment by 10.3–13.4 megawatts per year.

Additional findings specify that effective average tax rates have a stronger influence on property, plant, and equipment and on foreign direct investment (when financed with retained earnings) than do effective marginal tax rates. Studies also note distortions in asset allocation—such as under-investment in computing/electronics and over-investment in machinery/transportation—and reveal that large manufacturing firms show heightened sensitivity to marginal tax cuts compared with smaller, debt-financed firms. These results delineate distinct investment responses linked to marginal versus effective tax measures that vary by sector, firm size, and financing method.

The mechanisms by which taxes affect telecom investment are fairly complex. Devereux (2006) considers that taxation first affects two binary decisions: which business to invest (e.g. wireless, broadband, other) and which geographic location to invest (e.g. a specific state). While the first decision - which business - is not relevant to this study, the second one is critical. As McLure (1970) has explored, tax policy has a critical impact on industrial location, particularly under high capital mobility contexts. In addition, taxes also influence a continuous choice: once a business and locations are agreed upon based on taxation attractiveness, businesses see levies affecting their capital expenditure allocation process (in other words, taxes will influence how much will investment favor certain states to the detriment of others). This is confirmed by Mutti and Grubert (2000) who show that average effective tax rates have a significant effect on the choice of a location and the amount of capital invested there. A lower tax rate that increases the after-tax return to capital by one percent is associated with about 3 percent more real capital invested if the country has an open trade regime. The attractive power of low tax rates is weakened if the country has a more restrictive trade regime.

It should be noted that changes in tax regimes do not affect investment decisions instantaneously. Investment decisions are partially driven by variables that only change gradually (e.g. changes in the cost of capital). As a result, a modification of taxation regimes (e.g. a change in the sales tax rate affecting the initial purchasing of equipment) might affect the incentives to invest immediately but translate into investment decisions only gradually (Auerbach, 2005).

II.2. Taxation and capital spending in communications industries

While, as established above, the literature recognizes that taxation affects capital investment in different ways, the research assessing the general impact of taxation on the development of the telecommunications sector and the implied market outcomes has only been growing recently.

In a first study that focused on taxation impact of service industries, including telecommunications, Mansour (1998) estimated the impact of marginal effective tax rates, driven by corporate income taxes (both federal and states), labor and R&D taxes across industries and countries. His analysis indicated that while corporate income, capital, and provincial or federal taxes tend to lower investment attractiveness or operate neutrally, lower marginal tax rates on labor and R&D expenditures seem to favor investments in machinery, R&D, and exploration and development. The author also noted that service industries, including telecommunications, typically face a less favorable tax environment compared with other sectors.

In a first assessment of taxation impact on telecommunications specifically, Katz et al. (2010) conducted the first analysis focusing on the mobile broadband sector. The resulting study developed a taxonomy of approaches to imposing taxes on mobility services and assessed the impact of said approaches on the adoption of mobile broadband services. These estimates served as a basis to simulate the effect of changes in taxation on mobile broadband penetration and, consequently, on a country's economy. By relying on specific case studies from Mexico, Malaysia, South Africa, Brazil and Bangladesh, the authors estimated the economic effects of reducing mobile broadband consumer taxes by 1 percentage point. The authors focused on specific contributions such as VAT for services and handsets, finding that a reduction in taxation in the countries under study could potentially reduce the total cost of mobile ownership. This study supported other causal linkages, such as the impact of consumer taxes on mobile telecommunications adoption, with its corresponding effect on macroeconomic outcomes, such as GDP growth.

In support of these initial findings, other researchers have focused on the analysis of the impact of taxation in African countries. Andrianaivo and Kpodar (2011) raised the risk of African governments finding attractive to increase taxation on mobile communications, as these impositions are easy to administer and have a large base, at the cost of lowering adoption growth by leading to higher communication costs. Similarly, Calandro et al. (2013) analyzed the impact of taxation affecting the development of the mobile sector for a sample of African countries. The authors recommended removing barriers to investment and warning about the high costs for users as a result of regressive special taxes levied on communications and equipment.

In the same vein, Katz et al. (2017) studied tax contributions and financial returns of telecommunications operators in Latin America. Taking as a reference the 2014 operators financial reports, the authors estimated that nearly 43% of the value added generated by the sector was invested, while a significant amount of the value added (29.7%) contributed to the government treasuries through several channels: profit and social taxes, special contributions and taxes, custom fees for equipment imports and spectrum payments. These amounts excluded consumer related taxes.

The comparison with other industries reviewed yielded interesting results, since telecommunications were identified as the economic sector with the larger fiscal pressure in the region (51% over the average of all sectors). For instance, other sectors such as energy or other public services faced a fiscal pressure 11% lower than telecommunications sector.

Beyond the cross-national studies of taxation impact, a number of studies have focused on specific countries. For example, Koutroumpis et al. (2011) studied the impact of multi-layer service taxation on the Greek mobile sector between 2005 and 2010. The authors developed an econometric model linking consumption propensity of mobile voice service usage with the disposable income of users and the price of the product. Their results suggest that the adoption of high sector specific service taxes creates an economic distortion that lowers service usage, shrinks sector revenues, thereby affecting the competitiveness of the telecommunications industry. Similarly, Zamil and Hossen (2012) analyzed the case of Bangladesh, covering the period from 1997 to 2008. The authors focused their analysis on import duties, corporate taxes, and telecom-specific obligations (such as SIM tax). They argued about the potential gains in terms of sector development from a tax reduction, stating that the government should rethink and reconsider its tax policy to boost its digital agenda. In turn, Stork and Esselaar (2018), analyzed the tax imposition on the ICT sector in Uganda and Benin during period 2012-2018. For Uganda, particularly, they stated that the local government was using this economic sector as source of additional tax revenues instead of using it as a growth engine. Finally, Arawomo and Apanisile (2018) performed a study focused on Foreign Direct Investment in the telecommunications sector in Nigeria, covering the period 1986-2014. They concluded that the government should remove structural barriers by offering incentives such as tax holidays, import duties exemptions and subsidies to foreign firms.

In the United States context and as cited before, Katz and Callorda (2019) provided empirical evidence on the impact of taxation on network investment in the United States. They assessed the impact of sales taxes paid on broadband equipment acquisition on the level of telecommunications and cable industry investment in a model that included data from all US states, plus adding several specific state case studies (Florida, Georgia, Illinois, Kentucky, Oklahoma, Tennessee, and Texas). According to the econometric models developed by the authors, a decrease of 1 percentage point in the average weighted state and local sales tax rate affecting initial equipment purchases (from 4.58% to 3.58%) would increase investment by 1.97% over the current levels. By relying on input-output analysis, the authors also estimated the effect that this investment increases resulting from tax reductions can have in terms of economic contribution (GDP growth and cumulative output driven by broadband construction). A similar analysis was previously conducted by Katz and Callorda (2013), evaluating the impact of repealing a sale and use tax exemption on telecommunication equipment in the state of Minnesota. The study indicated that the telecommunication industry, stimulated in part by a sales tax exemption on the purchase of equipment, had invested \$5.167 billion between 2006 and 2012, which by virtue of the direct multipliers and spillover effects had contributed to the support of 112,239 jobs/year and generated \$10.38 billion in output. Based on econometric modelling and the results of survey research, it was estimated that

repealing the sales tax exemption would trigger a decrease in capital investment of \$153 million over two years, and \$722 million over the long run.

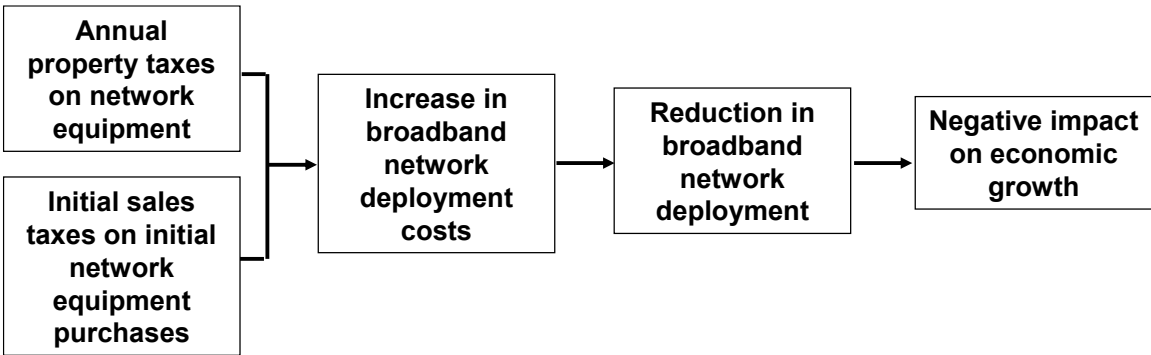
Recent research on the combined impact of multiple taxation policies on capital investment in communications industries confirms the findings yielded through general studies that tax structure is important in shaping investment incentives. Katz and Jung (2023) showed that, relying on a panel of 108 countries between 2009 and 2018 in the telecommunications sector, higher marginal tax rates—expressed as increases in regulatory fees, profit taxes, and customs duties—directly reduce capital investments in network infrastructure. Their simulation models also revealed that these tax increases indirectly depress investment by adversely affecting service pricing, network coverage, and technology adoption. In contrast, labor taxes, value-added tax, and other similar levies do not exhibit a negative impact on investment in this sector.

What are the mechanisms by which taxation impacts capital spending in telecommunications? Typical capital planning processes in communications comprise decisions in three domains: maintenance of existing plant (e.g. replacement of depreciated equipment), network modernization (e.g. deployment of 5G networks, fiber in the access network, or DOCSIS 4.0), and capacity upgrades (e.g. investment to accommodate growth in demand in specific geographies). Each investment domain is driven by different time constraints. For example, maintenance capital investment is typically multi-year and mostly non-discretionary; therefore, it is largely predictable and relatively less subject to taxation effects. Network modernization capital, while also being multi-year, could be affected by capital allocation decisions influenced by taxation (in other words, if taxation reduces the supply of funds, it could impact investment in new technology thereby affecting the rate of modernization). On the other hand, capacity upgrades have a long-term component driven by demand forecast, but also a very short-term component focused on surgical infrastructure upgrades (e.g. accommodate spikes in demand in certain portions of the network). This area of capital investment might be less affected by taxation regimes since it is directly linked to revenue generation opportunities.

II.3. Implications of a review of the research literature to the study design

The underlying causal chain to be addressed in the study is depicted in Figure II-1.

Figure II-1. Impact of taxes on Broadband Network Investment



According to the logic presented in Figure II-1, taxes on network equipment in the two dimensions mentioned above – property taxes and sales tax on equipment - may affect the deployment of broadband infrastructure by telecommunications carriers and cable operators. Suppliers of broadband services have their capital investments pre-determined by financial benchmarks (e.g., carriers typically tend to spend 15-20% of their sales in capital expenditures). Within this envelope, taxes could frame the allocation of capital across locations, thereby potentially negatively impacting deployment in certain geographies.

As supported by the evidence reviewed above, direct taxes such as sales taxes collected on initial network equipment purchases that are imposed on broadband service providers have a negative economic impact. Sales taxes are typically collected when a good or service is sold to its final consumer. The amount of the tax varies although it is usually based on a percentage of the sale amount. In the United States, sales taxes are collected at the state and local level. Since there can be several jurisdictions charging a sales tax, the retailer must add the amount of tax for each of them to calculate the Combined Sales Tax Rate. In the case of Internet sales, the rate used is that of the location where the consumer resides. Other taxes that are similar to the sales tax are the excise tax (charged on goods or sales produced within the country), and the gross receipt tax (charged on the gross revenues of a business or company). Sales tax on initial equipment purchase is a conventional way by which broadband service providers contribute to state and local tax revenues. Rates for this equipment can reach up to 10%, to which customs duties on network equipment may be added. The fundamental difference in sales taxes or import duties on purchased equipment is that both are charged to the firm producing the good (such as a telecommunications operator) rather than the consumer, although the operators may transfer some of these taxes to consumers. However, under conditions of competitive pressure and/or regulation, transferring the full amount of the tax to the consumer might be impossible, and the service provider might be put in a situation where investment is reduced. Even if all the taxes are passed on to the consumers, the consequent increased prices decrease output, thereby reducing the investment.

While not being considered in the scope this study, property taxes are another type of taxation imposed on broadband service providers. For example, in the United States these operators pay property taxes for the physical assets they own in each state. Payment of property taxes in many states is based on the notion that broadband providers are “utilities”, and as such, they need to pay taxes originally established for railroads and electric companies. The amount may be calculated by valuing the entire business enterprise, rather than summing up the fair market value of specific fixed assets owned by the business²². The key ratio in determining the tax to be paid is the so-called “assessment ratio”, which is the proportion of the property value that the tax rate is applied in establishing the amount to be paid in property taxes. In an example of sector discrimination, a number of states define higher assessment ratios to the property of telecommunications companies than the ratio applied to property of general businesses.

²² See Bierbaum, D., Fenwick, J. and Mackey, S. (2011). *Property Tax Discrimination: Barrier to Broadband*. Presentation at the ALEC Spring Conference. Cincinnati, OH, April 29, 2011.

II.3. Conclusion

To sum up, taxes can create distortions if they affect the choices made by market agents, which in the digital space could be as follows:

- Consumers, particularly those that are price sensitive, limit their adoption of technology.
- Telecommunications operators reduce their rate of investment in infrastructure.
- Global digital technology providers adapt their deployment footprint according to a minimization of tax burden.
- Different tax regimes within the digital ecosystem creates asymmetries.

In consequence, the design of an efficient tax structure in the digital space needs to consider several requirements:

- Ensure proper collection of taxes for income generated at source;
- Avoid over taxation of digital activities when compared to other industries;
- And, very relevant to this study, provide exemptions to facilitate investment in infrastructure and promote adoption by end-users.

Based on the research literature on the impact of taxation on telecommunications investment, a rigorous empirical strategy based on econometric models needs to incorporate control variables that go beyond the measurement of changes in taxation regimes to account for changes in the economic context of the served geography. For example, since investment levels are affected by whether the economy is expanding or contracting, it is important that variables measuring the performance of the economy (or alternatively including time fixed effects) in the models should be included. Likewise, given that investment is driven, to a large degree, by the imperative to capture market potential, it is critical to include variables and/or proxies for variables reflecting the intrinsic attractiveness of the business opportunity which could be captured by location fixed effects). Finally, while the models of communications investment rely on a single dependent variable (industry investment across the wireline, wireless, and cable sectors), this metric subsumes, as mentioned above, a number of management and capital planning allocation decisions, each one being influenced by specific conditions of taxation regimes. In that sense, it is critical to develop methodologies that accommodate the inertia of allocation processes, whereby future capital investments can be, to some degree, determined by the level of investment in prior years.

III. THE IMPACT OF TAXATION ON CAPITAL INVESTMENT IN COMMUNICATIONS NETWORK DEPLOYMENT IN THE UNITED STATES

III.1. Current level of investment and sales tax rate on initial communications network equipment purchasing

Telecommunications and cable service providers spending to acquire network equipment in 2024 in the United States reached \$51.147 billion, averaging \$150.38 per capita.²³ This figure represents the sum of investment of the major wireline telecommunications carriers (ATT, Lumen, and Verizon), the major wireless carriers (ATT, T-Mobile, and Verizon), as well as the three major cable providers (Charter, Comcast and Cox)²⁴. It includes only network investments, excluding other capital expenditures such as consumer premise equipment, vehicles, administrative offices, expenditures related to retail stores and any other “soft” costs typically not subject to sales/use tax.

An analysis of the investment trend over time between 2019 and 2024 reveals a dynamic period: spending peaked at \$184.73 per capita in 2022 before declining in subsequent years. Overall, from 2019 to 2024, the mean investment per capita saw a total decrease of 10.85% from \$168.68 in 2019 to \$150.38 in 2024 (see Table III-1).

Table III-1. Evolution of Communications Network Investment per Capita in the United States (2019-24)

YEAR	2019	2020	2021	2022	2023	2024	Total (2019-24)
Mean	\$168.68	\$168.87	\$173.47	\$184.73	\$159.29	\$150.38	\$167.50
Standard deviation	\$72.11	\$104.20	\$77.74	\$75.32	\$67.84	\$85.26	\$81.50

Sources: Broadband Tax Institute; Telecom Advisory Services analysis

In the period between 2014 and 2018, corresponding to Telecom Advisory Services’ prior study (Katz and Callorda, 2019), the average investment across states was \$ 130.57 per capita. However, between 2014 and 2018 the standard deviation, defined as the amount of dispersion across investment per capita by each state, was \$76.51. In the current study the average investment across states has increased to \$167.50 (an increase of 28.28%) while the standard deviation also grew to \$81.50 (a 6.52% increase). The trend is clear: while companies are investing more overall compared to the previous period, a polarization effect is emerging, with investment becoming

²³ Source: Broadband Tax Institute. It should be noted that only a portion of this total capital expenditure is subject to sales tax. The taxable base is estimated to be 80% of wireless network investment and 60% of wireline and cable network investment. Based on that, the taxable telecommunications and cable service providers spending to acquire network equipment in 2024 reached \$35.413 billion

²⁴ This amount excludes non network CAPEX, as reported by Charter, Comcast, and Cox (representing 88% of the cable industry), combined with ATT, Lumen, Verizon, and T-Mobile (which accounts in excess of 80% of the telecommunications sector).

more concentrated in certain states. While it is obvious that, as stated in the research literature reviewed above, conventional variables such as market potential and competitive imperative drive investment intensity, it is pertinent to raise the question as to what the role of taxation is in driving capital investment levels and the growing polarization across geographies.

In 2024, the weighted average sales tax rate on initial equipment purchase for the cable industry was 4.66%, and the weighted average rate for wireless and wireline providers was 5.26%, while the arithmetic mean was 4.07% and the total weighted tax rate was 5.12%²⁵. The six-year average sales tax on communications equipment purchase between 2019 and 2024 has been relatively stable (around 5.21%), with no major change in the standard deviation across states over time (see Table III-2).

Table III-2. Evolution of US Sales Tax on Communications investment (2019-2024)

Year	2019	2020	2021	2022	2023	2024
Arithmetic Mean	4.44%	4.46%	4.45%	4.28%	4.06%	4.07%
Weighted Mean	5.16%	5.36%	5.37%	5.22%	4.97%	5.12%
Standard deviation	3.50%	3.53%	3.52%	3.49%	3.47%	3.46%
States with tax exemption for all communications network equipment	13	13	13	14	16	16
States with at least one type of exemption	20	20	20	20	22	22

Sources: Broadband Tax Institute; Telecom Advisory Services analysis

It is important to note that the taxation on initial communications equipment purchase does not represent a homogeneous imposition across the country. In 2024, the number of states with sales tax exemption for communications network equipment was 16, while the number of states with at least one type of exemption (either cable or telecommunications) was 22. More importantly, since 2019, 17 states have increased their state and local sales tax rate for all communications equipment, while 23 states have done so for at least one technology (see Table III-3).

Table III-3. State and Local Sales tax rate on communications equipment purchasing (2019-2024)

State	2019		2024	
	Telecom	Cable	Telecom	Cable
Alabama	6.14%	9.14%	6.29%	9.29%
Alaska	1.43%	1.43%	1.82%	1.82%
Arkansas	9.43%	9.43%	9.45%	9.45%
Arizona	0.00%	8.37%	0.00%	8.38%
California	8.56%	8.56%	8.85%	8.85%
Colorado	7.63%	7.63%	7.81%	7.81%
Connecticut	0.00%	0.00%	0.00%	0.00%
Delaware	0.00%	0.00%	0.00%	0.00%
D.C.	0.00%	6.00%	0.00%	6.00%
Florida	7.05%	7.05%	7.00%	7.00%

²⁵ The weighted average is the key metric used for the impact analysis throughout this report. The impact analysis contained in this report relies on weighted average tax rates by state and sector. See Appendix B for a weighted average calculation.

State	2019		2024	
	Telecom	Cable	Telecom	Cable
Georgia	7.29%	7.29%	7.38%	7.38%
Hawaii	4.41%	4.41%	4.50%	4.50%
Idaho	6.03%	6.03%	6.03%	6.03%
Illinois	8.74%	8.74%	8.85%	6.00%
Indiana	0.00%	0.00%	0.00%	0.00%
Iowa	0.00%	0.00%	0.00%	0.00%
Kansas	8.67%	8.67%	0.00%	0.00%
Kentucky	6.00%	6.00%	6.00%	6.00%
Louisiana	9.45%	9.45%	9.56%	9.56%
Maine	5.50%	5.50%	5.50%	5.50%
Massachusetts	6.25%	6.25%	6.25%	6.25%
Maryland	6.00%	6.00%	6.00%	6.00%
Michigan	0.60%	6.00%	0.60%	6.00%
Minnesota	0.00%	0.00%	0.00%	0.00%
Missouri	0.00%	8.13%	0.00%	8.38%
Mississippi	7.07%	7.07%	7.06%	7.06%
Montana	0.00%	0.00%	0.00%	0.00%
North Carolina	0.00%	0.00%	0.00%	0.00%
Nebraska	6.85%	6.85%	6.97%	6.97%
New Jersey	0.00%	0.00%	0.00%	0.00%
New Mexico	7.82%	7.82%	7.62%	7.62%
Nevada	8.14%	8.14%	8.24%	8.24%
New Hampshire	0.00%	0.00%	0.00%	0.00%
New York	0.00%	8.49%	0.00%	8.53%
North Dakota	6.85%	6.85%	7.04%	7.04%
Ohio	0.00%	0.00%	0.00%	0.00%
Oklahoma	8.92%	8.92%	8.99%	8.99%
Oregon	0.00%	0.00%	0.00%	0.00%
Pennsylvania	0.00%	0.00%	0.00%	0.00%
Rhode Island	7.00%	7.00%	7.00%	7.00%
South Carolina	7.43%	0.00%	7.50%	0.00%
South Dakota	6.40%	6.40%	6.11%	6.11%
Tennessee	9.47%	9.47%	0.00%	0.00%
Texas	5.69%	5.69%	5.70%	5.70%
Utah	0.00%	6.94%	0.00%	7.23%
Virginia	5.65%	0.00%	0.00%	0.00%
Vermont	6.18%	6.18%	6.36%	6.36%
Washington	9.17%	9.17%	9.38%	9.38%
West Virginia	0.00%	0.00%	0.00%	0.00%
Wisconsin	5.44%	5.44%	5.70%	5.70%
Wyoming	5.36%	5.36%	5.44%	5.44%

Increase		Decrease		Stable	
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Source: Tax Foundation

Returning to the original question, is sales taxation of network equipment contributing to the polarization between states receiving higher investment than others? If the standard deviation of the sales tax rate has not changed since 2019, one might assume that it does not play a role. However, recognizing that market potential and competition are key drivers of investment, it is reasonable to consider that taxes should play a role in terms of addressing state investment inequality.

III.2. Model explaining the impact of sales tax rate on investment by cable and telecommunications companies

Chapter II established a strong theoretical foundation, drawing from a wide body of academic literature, for the principle that taxation can significantly influence corporate capital investment decisions. Having reviewed the mechanisms by which taxes can deter investment by increasing costs and reducing the supply of funds, we now move from the theoretical to the empirical. This section builds directly on that foundation by developing a set of robust econometric models designed to specifically quantify the relationship between sales tax rates and the investment behavior of telecommunications and cable companies in the United States. The objective is to empirically test the central hypothesis of this study: that higher sales taxes on communications equipment lead to a measurable and statistically significant reduction in network investment. To achieve this, we will construct a model that not only isolates the impact of taxation but also accounts for the complex, dynamic nature of capital planning and the diverse economic conditions across states.

To properly analyze this relationship, a dynamic panel data model with two-way fixed effects is employed. To construct the econometric model, a dataset was compiled covering 42 U.S. states and the District of Columbia for the period from 2019 to 2024²⁶. The variables used in the analysis were sourced as follows:

- **Per Capita Capital Expenditure (CAPEX):** Data on communications network investment, encompassing expenditures by major wireline (ATT, Lumen, and Verizon), wireless (ATT, T-Mobile, and Verizon), and cable providers (Charter, Comcast and Cox), was provided by the Broadband Tax Institute. The starting values accounted for all capital expenditures from which the portion that is not strictly linked to network equipment was excluded.
- **Sales Tax Rate (Taxes):** State and local sales tax rates applied to the purchase of communications equipment were obtained from the Tax Foundation.
- **Median Household Income (Median Income):** State-level median household income data, used as a proxy for consumer demand and overall economic health, was sourced from the U.S. Bureau of Economic Analysis.
- **Unemployment Rate (Unemployment):** State unemployment rates, included to control for local labor market conditions and economic distress, were sourced from the U.S. Bureau of Labor Statistics.

The following table presents the descriptive statistics for the key variables used in the model over the analysis period (2019-2024).

²⁶ Alaska, Hawaii, Iowa, Maine, New Hampshire, North Dakota, Vermont, and West Virginia are excluded from the econometric analysis due to a lack of complete CAPEX data for at least one technology.

Table III-4. Descriptive Statistics of Model Variables (2019-2024)

Variable	Description	Mean	Standard Deviation
Per Capita Investment (CAPEX)	Network capital expenditure per capita (in USD).	\$139.12	\$67.86
Total Tax Rate (Taxes)	Average sales tax rate on equipment across wireless, wireline and cable	4.40%	3.50%
Median Income	Median household income (in USD)	\$66,763	\$11,175
Unemployment Rate	Percentage of the labor force that is unemployed	3.90%	1.08%

Sources: Broadband Tax Institute; Tax Foundation; US Bureau of Economic Analysis; US Bureau of Labor Statistics; Telecom Advisory Services analysis

The empirical strategy needs to address several analytical challenges and ensure the validity of the results. Investment decisions are inherently dynamic; they are not made in a vacuum each year but are instead heavily influenced by previous capital expenditures and long-term strategic plans. To capture this crucial element of persistence, or "inertia," the model includes two lagged periods of the dependent variable (per capita investment). Furthermore, the United States is composed of economically and geographically diverse states, each with unique, time-invariant characteristics—such as regulatory history, topography, or population density—that could influence investment levels. The inclusion of state-level fixed effects controls for all such unobserved heterogeneity, ensuring that the estimated tax effect is not biased by these underlying state-specific factors. In parallel, the model incorporates year-level fixed effects to account for nationwide shocks or trends that affect all states simultaneously in a given year, such as national business cycles, federal policy changes, the pandemic, or major technological advancements. This two-way fixed effects structure is critical, as it allows the model to isolate the precise impact of changes in tax policy *within* a state over time, providing a far more robust estimate than simpler cross-sectional or time-series models. Finally, to ensure the reliability of our statistical inferences, standard errors are clustered at the state level, a procedure that corrects for potential issues of autocorrelation within states over time and for heteroskedasticity.²⁷

The general model is specified as follows:

$$\ln(\text{CAPEX}_{it}) = \alpha_i + \delta_t + \beta_1 \ln(\text{CAPEX}_{it-1}) + \beta_2 \ln(\text{CAPEX}_{it-2}) + \gamma \text{Taxes}_{it-1} + \theta' X_{it-1} + \epsilon_{it}$$

Where:

- $\ln(\text{CAPEX}_{it})$ is the natural log of per capita capital expenditure in state i at time t .

²⁷ Heteroskedasticity is a situation in statistical models, particularly regression, where the variance of the error terms (or residuals) is not constant across all observations. This violates a core assumption of Ordinary Least Squares (OLS) regression, which can lead to unreliable standard errors and invalid statistical inferences

- $\ln(\text{CAPEX}_{it-1})$ and $\ln(\text{CAPEX}_{it-2})$: Represent the natural log of per capita capital expenditure from the previous one and two periods, respectively. These terms are included as controls to account for investment inertia.
- α_i represents the state fixed effects.
- δ_t represents the year fixed effects.
- Taxes_{it-1} is the lagged total tax rate.
- X_{it-1} is a vector of lagged control variables.
- ϵ_{it} is the error term.

The general model is specified to explain the natural log of per capita capital expenditure as a function of its own past values, the lagged total tax rate, and a vector of essential control variables. The primary independent variable of interest is the weighted average tax rate on communications equipment, which is lagged by one year. This lag is methodologically important as it helps to mitigate issues of simultaneity and reflects the practical reality that corporate investment decisions are not made instantaneously but rather respond to policy changes with a delay. To account for the prevailing economic conditions that naturally influence any firm's decision to invest, the model includes lagged median household income as a proxy for consumer demand and overall economic health, as well as the lagged unemployment rate to control for local labor market conditions and economic distress. The table below presents the results from four different specifications of the model, incrementally adding these control variables to demonstrate the stability and consistency of the tax coefficient (See Table III-5).

Table III-5. Model of Impact of Sales Tax Rate on Investment

Variable	Model (1)	Model (2)	Model (3)	Model (4)
$\ln(\text{CAPEX}_{it-1})$	0.19986 (0.19191)	0.20690 (0.20533)	0.19899 (0.18952)	0.20483 (0.20116)
$\ln(\text{CAPEX}_{it-2})$	0.03820 (0.07958)	0.04443 (0.07397)	0.05079 (0.07983)	0.05463 (0.07558)
Total Taxes_{it-1}	-0.02175 * (0.01181)	-0.02183 * (0.01167)	-0.02090 * (0.01127)	-0.02105 * (0.01118)
Median Income_{it-1}		0.00002 (0.00003)		0.00001 (0.00003)
Unemployment $_{it-1}$			0.03192 (0.03012)	0.02876 (0.02907)
Constant	3.15516 *** (0.95354)	2.44196 (1.62333)	3.00979 *** (0.92679)	2.44132 (1.58256)
Observations	172	172	172	172
R-squared Adj.	0.8649	0.86573	0.86704	0.86721
State Fixed Effects	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES

Note: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Sources: Broadband Tax Institute; Telecom Advisory Services analysis

The results presented in Table III-5 are remarkably stable and consistent across all four models, which strengthens confidence in the findings. The models are specified incrementally to test the robustness of the tax variable under different conditions. Model (1) establishes the baseline relationship by regressing per capita investment

on its own past values and the lagged sales tax rate, properly accounting for the inherent inertia in capital planning. This specification yields a tax coefficient of -0.02175 and includes controls for investment from the prior year (coefficient of 0.19986) and two years prior (0.03820) not statistically significant. Model (2) then builds upon this by introducing lagged median household income to control for the state's overall economic health and consumer demand. In this case, the tax coefficient remains stable at -0.02183, while the newly added median income control has a coefficient of 0.00002 not statistically significant. Model (3) provides an alternative specification, adding the lagged unemployment rate to the baseline model to account for local labor market conditions. This results in a tax coefficient of -0.02090, with unemployment control showing a coefficient of 0.03192 not statistically significant. Finally, Model (4) represents the full and preferred specification, simultaneously including all previously mentioned variables to control for investment inertia, tax policy, and key economic conditions. Notably, the inclusion of median household income as a proxy for market demand slightly tempers the coefficient's magnitude compared to the baseline, which suggests the model is successfully isolating the direct impact of tax policy from broader economic factors. While the control variables themselves are not statistically significant in this specification, the remarkable consistency of the tax coefficient's negative sign and significance across all four models provides strong evidence for the study's central hypothesis

The preferred and most comprehensive specification is Model (4), as it includes the full set of controls and exhibits the highest adjusted R-squared value of 0.8672, indicating that the model successfully explains a very large portion of the variation in per capita communications investment. The central finding of this analysis is the coefficient on the total taxes of the previous period variable. In model (4), this coefficient is -0.02105 and is statistically significant at the 10% level. The practical interpretation of this result is direct and powerful: holding all other factors constant, **a 1 percentage point increase in the state-level sales tax rate on communications equipment is associated with a 2.1% decrease in per capita capital investment in the subsequent year.**

The negative sign is entirely consistent with the economic theory discussed in Chapter II, confirming that higher tax burdens create a disincentive for investment. Furthermore, the positive and significant coefficients on the lagged investment terms confirm the dynamic nature of investment and validate the methodological choice to include them. In conclusion, this econometric analysis provides robust empirical evidence to support the hypothesis that higher state-level taxes on telecommunications services lead directly to a tangible and meaningful reduction in the subsequent capital investment made by firms in the sector.

In conclusion, this econometric model for a panel data between 2019 and 2024 provides robust empirical evidence to support the hypothesis that higher state-level taxes on communications equipment lead directly to a tangible and meaningful reduction in the subsequent capital investment made by firms in the communications sector. Furthermore, the coefficients on the lagged investment terms are consistently positive, which aligns with the dynamic nature of capital planning. While these coefficients do not reach statistical significance in this

specification, they are retained in the model to properly account for investment inertia—the principle that current capital expenditures are heavily influenced by prior commitments. Their inclusion is theoretically sound and crucial for a correctly specified model.

III.3. Impact of sales tax rate on investment by cable and telecommunications service providers in specific states

In addition to the econometric approach, we also assess, on a descriptive basis, the impact of a reduction or an increase of the sales tax rate on equipment purchasing by examining the actual investment behavior of telecommunications carriers and cable operators in states that enacted such policies.

Missouri presents a compelling case study of how incremental tax increases can correlate with decreased investment. While the state's weighted average sales tax rate fluctuated, it ultimately increased from 1.40% in 2019 to 2.28% in 2024. This change was driven entirely by the tax on cable equipment, as wireless and wireline investments are exempted. Observing the cable investment data reveals a sharp reaction: after reaching a peak of \$57.56 per capita in 2023, investment plummeted to \$45.43 in 2024.

Utah presents a complex case study where multiple market factors appear to influence investment trends simultaneously. During the analysis period, the state's weighted average tax rate on communications equipment more than doubled from 1.36% to 3.06%, an increase driven exclusively by the rising sales tax on cable network equipment. While total per capita investment in the state declined after 2020, investment specifically in the taxed cable sector showed consistent growth. However, it is crucial to recognize that the rising tax burden acted as a direct headwind on this growth. While other market dynamics were clearly strong enough to fuel continued cable investment, the increasing tax raised the cost of every new deployment, suggesting that this growth could have been even more robust had the tax not been in place.

At the other end, states that implemented tax exemptions demonstrate the powerful stimulating effect of such policies. Tennessee provides a stark example, having eliminated its substantial sales tax on all communications equipment. The tax rate, which stood at 9.55% in 2021, was effectively halved to 4.78% in 2022 as the new policy took effect, before dropping to 0% in 2023. The impact on investment was both immediate and dramatic. Per capita investment, which was \$167.43 in 2021, surged to a record \$197.62 in 2022—the year the tax cut began. While spending levels moderated in 2023 and 2024, they remained significantly higher than the levels seen before the tax was eliminated. This clearly illustrates a strong positive relationship between the removal of the tax and a significant boost in capital deployment for network infrastructure.

Similarly, the Kansas example demonstrates the positive impact of a tax exemption, although its effects are best observed after adjusting the historical investment data. Initial figures for 2019 and 2020 were adjusted to remove significant, one-time integration expenses related to the T-Mobile/Sprint merger, establishing a more

representative baseline. In 2021, the last full year before the tax policy change, per capita investment in the state stood at \$154.48. Following the elimination of the state's high sales tax of over 8.70% in 2023, investment rebounded strongly to \$185.82 per capita in 2024. This represents a significant increase of over 20% compared to the 2021 pre-exemption level. This robust growth, clearly points toward the positive effects of removing the tax burden and fostering a stronger environment for sustained capital investment.

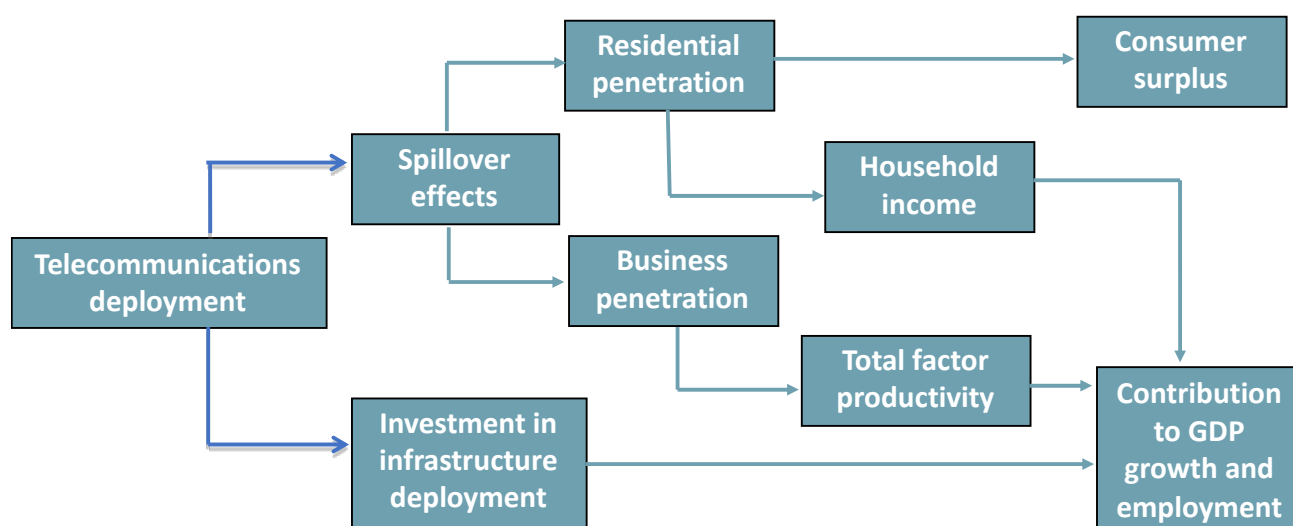
These four examples can be understood with the help of the framework developed by Devereux (2006) and discussed in Chapter II. When a state legislature votes to increase sales taxes on equipment purchase, it sends a signal to operators regarding the relative attractiveness of investing in that state. In the decision of how much capital investment will favor certain states to the detriment of others, the operators subsume two different reactions. The first one refers to the supply of funds decision, which means that “dollar for dollar”, the money saved in taxes flows to investment. The second one is what Lintner (1954) calls the incentive reaction, whereby funds that could have been invested in other states, now tend to flow away from the state that has increased its sales tax rate. The inverse effects also apply in terms of sales reduction increasing capital flows.

IV. RESEARCH EVIDENCE OF THE ECONOMIC IMPACT OF TELECOMMUNICATIONS

If sales taxes reduce communications investment (as shown in the review of the literature of Chapter II), and communications, especially broadband, have a positive contribution to economic growth and job creation through network construction and economic spillovers, it stands to reason that a reduction of investment resulting from increasing sales taxes should have a negative economic impact. In this chapter, we review the research evidence generated so far regarding the positive socio-economic impact of broadband services.

Broadband has been found to have multiple economic impacts, ranging from the growth of output to job creation and increasing consumer surplus (see Figure IV-1).

Figure IV-1. Broadband Economic Impact



Source: Katz (2012)

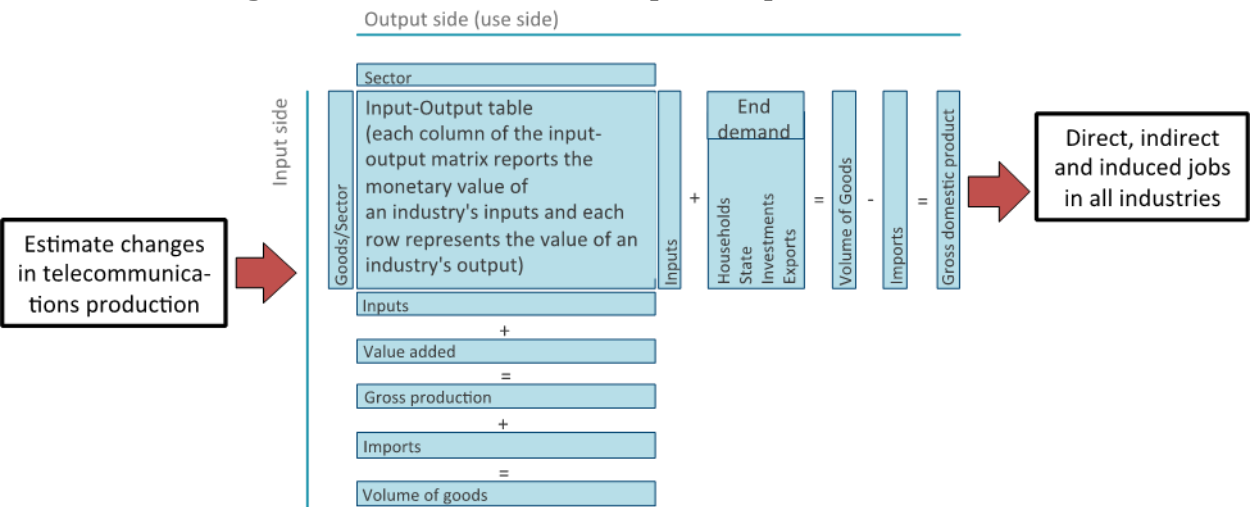
The first effect results from the construction of broadband networks. As with any infrastructure project, the deployment of broadband networks directly creates jobs, which has effects throughout the economy by means of multipliers. The second effect results from the “spill-over” externalities, which impact both enterprises and consumers. For example, the adoption of broadband communications within firms leads to a multifactor productivity gain, which in turn contributes to the growth of GDP and employment. In addition, residential adoption drives an increase in household real income as a result of enhanced access to the job market and improved skills, among other factors. Residential users also receive a benefit in terms of consumer surplus, defined as the difference between what they would be willing to pay for broadband services and their actual price. This last measure, while not being captured in the GDP statistics, can be significant, insofar that it represents benefits in terms of enhanced access to information, entertainment and public services. Each effect will be reviewed in turn.

IV.1. The broadband deployment effect

Broadband deployment requires capital spending which, in turn, translates into GDP growth and jobs. Broadband construction affects the economy and employment in three ways. In the first place, the capital investment to deploy infrastructure translates into additional GDP and direct jobs (such as telecommunications technicians, construction workers, and manufacturers of the required telecommunications equipment). In addition, this spending creates indirect spending triggered by upstream buying and selling between communications service providers constructing their networks and their suppliers of intermediate inputs (electronic equipment, metal products, etc.). Finally, the household spending resulting from the income generated from the direct and indirect effects yielded by broadband deployment creates additional “induced” economic effects throughout the economy.

The investment related effects are calculated through input/output (I/O) tables which depict all intersectoral relationships of the US economy and calculate multipliers estimating the impact of investment across all three categories of effects (direct, indirect and induced effects). The structure of an I/O table comprises horizontal rows describing how an industry’s total output is divided among various production processes and final consumption, and each column denotes the combination of productive resources used within one industry (see Figure IV-2).

Figure IV-2. Structure of an Input-Output Matrix



Source: Telecom Advisory Services

I-O tables assume that some inputs are used by sectors that produce output (intermediate output), which in turn is sold to another sector for consumption (final output), while total output adds intermediate and final outputs. By using output by sector / labor by sector, one can calculate job creation from output assuming a constant labor productivity ratio (see Figure IV-3).

Figure IV-3. Example of Output of Input / Output Results Table

Direct, indirect and induced effects			
Value Added	Direct Effect	\$ 8,029.2	million
	Indirect Effect	\$ 2,922.4	million
	Induced Effect	\$ 482.2	million
	Total Effect	\$ 11,433.8	million
Employment	Direct Effect	81,826	employees
	Indirect Effect	29,274	employees
	Induced Effect	11,098	employees
	Total Effect	122,198	employees
Total Industry Output	Direct Effect	12,000	million
	Indirect Effect	7,012	million
	Induced Effect	941	million
	Total Effect	19,953	million

Source: Telecom Advisory Services

As indicated in Figure IV-3, the input-output table can estimate the one-time impact of investment in broadband deployment on employment and GDP, differentiating between direct, indirect, and induced effects. In addition, since the tables are based on the interrelationships among sectors and quantify the intermediate goods produced in country versus those that are imported, the portion of the network investment that is “leaked” to foreign providers can also be estimated. The tailored output of the input/output tables calculate the additional production (both domestic and imported), intermediate inputs and additional value added. Finally, the I/O table can also estimate the breakdown of jobs to be created by sector. The calculation of the investment effects of broadband deployment requires entering in the I/O table the estimated spending required for deploying the cable, broken down by economic sector (for example, construction, electronic equipment, etc.).

Eight national studies have estimated the impact of broadband network construction on GDP and job creation: Crandall et al. (2003), Atkinson et al. (2009), Liebenau et al. (2009), and in prior research carried out by the author (Katz et al., 2008, Katz et al., 2009, Katz et al., 2010; Katz et al., 2020; Katz et al., 2024). All of these studies relied on input-output analysis and assumed a given amount of capital investment (see Table IV-1).²⁸

²⁸ Input-output tables measure the interdependence of an economy’s productive sectors by considering the product of each industry both as a commodity demanded for final consumption and as a factor in the production of itself and other goods. While input-output tables are a reliable tool for predicting investment impact, they are static models reflecting the interrelationship between economic sectors at a certain point in time and are only infrequently updated. Since those interactions may change, the matrices from one period may overestimate or underestimate the impact of broadband deployment in a different period. For example, if the electronic equipment

Table IV-1: Economic impact of network deployment

Country	Authors – Institution (*)	Objective	Results
United States	Crandall et al. (2003) – Criterion Economics	Estimate the employment impact of US\$63.6 billion in broadband deployment aimed at increasing household adoption from 60% to 95%, requiring an investment of US\$ 63.6 billion	• Creation of 61,000 jobs per year over nineteen years • Total jobs: 1.159 million (including 546,000 for construction and 665,000 indirect)
	Atkinson et al. (2009) – ITIF	Estimate the impact of a US\$10 billion investment in broadband deployment	• Total jobs: 498,000 jobs if investment achieved in one year (including 64,000 direct, 166,000 indirect and induced, and 268,000 in network effects)
	Katz and Suter (2009)	Estimate the impact of investing US\$6.39 billion for broadband deployment	• Total jobs: 127,800 direct and indirect
	Katz and Callorda (2020)	Estimate the impact of investment of \$81.4 billion over seven years for deployment of DOCSIS 4.0 by cable networks	• Total jobs: 376,000 jobs over a seven-year span required for deployment
	Katz et al. (2024)	Estimate the impact of \$76 million investment in landing facility for a submarine cable in Seattle, WA	• Total jobs: 353 jobs over a required for construction of landing site in one year
Switzerland	Katz et al. (2008) – Telecom Advisory Services /Polynomics	Estimate the impact of deploying a national broadband network requiring an investment of CHF 13 billion	• Total jobs: 114,000 over four years (including 83,000 direct and 31,000 indirect)
United Kingdom	Liebenau et al. (2009) – London School of Economics	Estimate the impact of investing US\$6.4 billion to achieve the target of the “Digital Britain” Plan	• Total jobs: 280,000 jobs if investment achieved in one year (including 76,500 direct, 134,500 indirect and induced, and 69,500 in network effects)
Germany	Katz et al. (2010)	Estimate the impact of investing EUR 20.243 billion for implementing the 2014 Broadband Strategy	• Total GDP: EUR 20.2 billion in investment and EUR 52.32 billion in additional output • Total jobs: 304,000 jobs (including 158,000 direct, 71,000 indirect and 75,000 induced)

Source: Compiled by Telecom Advisory Services

industry is outsourcing jobs overseas at a fast pace, the employment impact of broadband deployment will diminish over time and part of the investment will “leak” overseas.

All studies calculated multipliers, which measure the total output and employment change throughout the economy resulting from the deployment of a broadband network.²⁹

IV.2. Broadband spillover effects

Studies on the spillover impact of telecommunications have been produced for the past four decades confirming, to a large extent, that wireline and wireless telephony, as well as fixed and mobile broadband have an impact on economic growth and, in some cases, on employment and productivity (Hardy, 1980; Karner and Onyeji, 2007; Jensen, 2007; Katz et al., 2010; Katz, 2011; Katz et al., 2012a; Katz et al., 2012b, Arvin and Pradhan, 2014; Briglauer and Gugler, 2019; Katz and Callorda, 2020; Briglauer et al., 2021; Katz and Jung, 2021; Katz and Jung, 2022).

The impact of broadband has been widely studied in the economic growth literature, with an important part of that research conducted with United States data, due to the early network deployments and the extensive availability of datasets. Initial studies in the United States have been primarily focused on estimating the contribution of broadband to GDP growth. Gillett et al. (2006) conducted the first econometric study measuring the impact of fixed broadband availability on local economic development using sub-state geographic data. The study classified each ZIP (postal) code area based on its broadband availability in 1999 and then followed the growth in economic indicators over time. The statistical methodology included matching ZIP code areas with broadband to those without to create “treatment” and “control” groups, and then used regression analysis, and other econometric techniques to distinguish causality from mere correlation. The major findings of the study were that broadband added 1.0 to 1.4 per cent to the growth rate of local employment, and 0.5 to 1.2 per cent to the growth rate of the number of business establishments from 1998 to 2002.

Lehr et al. (2006) also relied on US zip-code areas and states to estimate the economic impact of broadband in the United States. Using regression analysis and matching estimators, they found a positive effect of broadband on employment, on the number of businesses, and on property values. However, they did not observe a significant effect on wages. The authors acknowledged that endogeneity was a concern, suggesting that future research should rely on instrumental variable techniques to better control for potential problems deriving from omitted variables and reverse causality.³⁰

Following the first studies, Crandall et al. (2007) applied a cross-sectional dataset using broadband penetration data to determine the impact of the technology on output. This study provided some empirical support for the conclusion that expanded broadband capacity led to an increase in GDP, particularly in the service

²⁹ Multipliers are of two types. Type I multipliers measure the direct and indirect effects (direct plus indirect divided by the direct effect), while Type II multipliers measure Type I effects plus induced effects (direct plus indirect plus induced divided by the direct effect).

³⁰ In econometrics, endogeneity broadly refers to situations in which an explanatory variable is correlated with the error term. It might lead to biased estimates. Instrumental variables are commonly used to address this problem.

sector, namely finance, real estate, and educational services. However, the correlation between broadband penetration and GDP lacked statistical significance.

In a subsequent study, Kolko (2010) found that broadband expansion is correlated with economic growth over the period 1999-2006. This relationship was strongest in industries that relied heavily on ICT: information; professional, scientific, and technical services; management; and administrative services. The author estimated an instrumental variables regression that explicitly accounted for the potential simultaneity of broadband and employment growth.

Since the early 2010s, most researchers on the economic impact of broadband have attempted to address the problem of endogeneity. For example, Kandilov and Renkow (2010) used a difference-in-differences approach combined with a matching strategy to analyze the effect of a broadband deployment program in US rural areas, concluding that, between 2002 and 2003 the technology had not had yet a significant impact on their economic development (as measured by employment, payroll, and the number of business establishments) possibly because not enough time had elapsed for the impact to happen. A more spatially disaggregated analysis revealed, however, that a positive economic impact of rural broadband was identified in communities located closest to urban areas.

The comparison of the economic performance of geographies with different levels of broadband deployment but controlling for other characteristics, using the matching approach, has also been the strategy followed to estimate a causal link in the studies of Whitacre et al. (2014) and Ford (2018). The first study used US county data between 2001 and 2010 and concluded that median household income, employment, and the number of firms increased faster in counties with higher broadband adoption, whereas they experienced lower unemployment. In addition, the study results suggested that higher download speed was associated with less poverty and more creative class employment. In turn, Ford (2018) also focused on the local economic effects of increasing broadband speed, although his results were less positive. Using US county-level data for the 2013-2015 period, his study showed that broadband services and upgrades were not randomly distributed in the territory, which could result in misleading conclusions about their economic impact. Once differences in observed characteristics between the counties were controlled, the study concluded that there was no significant effect of higher broadband speed on economic outcomes, including jobs, earnings, and total personal income.

Other recent studies conducted for the US at the subnational level have also dealt with the endogeneity of the broadband indicator in a regression framework. They included controls of the differences in observed and unobserved characteristics (fixed effects) of the spatial units under analysis to minimize the concern about the omitted variables bias. In addition, some of these studies used Instrumental Variables (IV) to deal with the potential problem of reverse causality. For example, Forman et al. (2012) used the cost of internet deployment, local connections to older networks, and a proxy of demand, to identify a positive causal effect of investments in advanced internet technologies on wages and employment in the US counties from 1995 to 2000. A positive contribution was observed only for a reduced number of counties, characterized by intensive usage of IT and high skills, income, and

population density. Similarly, Kolko (2012) assessed the impact of broadband availability on county employment using an IV estimator, based on the average slope of the terrain as an instrument of the broadband indicator. The results in this research suggested a positive causal effect of broadband on employment, although the author acknowledged that IV estimates might be upwardly biased. Mack and Rey (2014) showed that broadband availability in 2004 stimulated the number of knowledge-intensive firms in the counties of 49 of the 54 US metropolitan areas. The authors combined techniques to deal with spatial dependence with an IV estimator that used the lagged values of the broadband indicator and the county's household density. Finally, Mack and Faggian (2013) developed a series of spatial econometric models that examined the link between broadband provision and productivity for US counties. The developed models also evaluated the variability in broadband impact related to the quality of human capital. The results in this case suggested that in general, broadband has a positive impact on productivity only in territories with high levels of human capital and/or highly skilled occupations. Other studies suggest that the availability of high-speed broadband is an important determinant of rural firm location (Mack, 2014).

The COVID pandemic also prompted to understand broadband economic contribution. Katz and Jung (2022) studied the role of broadband in mitigating the economic losses resulting from COVID-19 in the United States by providing a necessary infrastructure to keep economic systems operating, albeit partially. The study was based on an empirical framework underlined by a Cobb–Douglas production function and estimated within a structural multi-equation model through the three-stage least squares approach. To consider the impact of COVID-19 on the economy, they relied on two main variables: an indicator of the quantity of deaths attributed to the disease for every 100,000 inhabitants; and the Stringency Index, a metric linked to the intensity of social restrictions imposed by national and local governments. The study provided robust evidence that those states with higher broadband adoption were able to mitigate a larger portion of their economic losses derived from the pandemic-induced lockdowns.

A critical issue of the evolving research on broadband spillovers is the issue of whether there is a linear relationship between broadband adoption and economic growth, whereby higher penetration yields larger impact? Or, alternatively, are we in the presence of more complex non-linear causal effects, such as “increasing returns to scale” and/or diminishing returns due to saturation? The question remains whether there is a point after which additional penetration does not yield economic spillover growth. Research points to the existence of a saturation point of declining returns to broadband penetration.

For example, Atkinson *et al.* (2009) pointed out that network externalities decline with the build out of networks and the maturation of technology over time. There is evidence that supports this argument. It has been demonstrated in diffusion theory that early technology adopters are generally those who can elicit the higher returns of a given innovation. Conversely, network externalities would tend to diminish over time because those effects would not be as strong for late adopters. Gillett *et al.* (2006) contend that the relation between penetration and economic impact should not be linear “because broadband will be adopted (...) first by those who get the

greatest benefit (while) late adopters (...) will realize a lesser benefit” (pp. 10). In confirmation of diminishing returns to broadband penetration, in their study of the state of Kentucky, Shideler et al. (2007) estimated that employment growth is highest around the mean level of broadband saturation at the county level, driven by the decreasing returns to scale of the infrastructure. According to the research, a critical amount of broadband infrastructure may be needed to sizably increase employment, but once a community is completely built out, additional broadband infrastructure will not further affect employment growth.

That said, the spillover impact of broadband at higher penetration levels still remains, although it occurs through another variable: broadband speed. Two types of effects explain this causal relationship. First, faster broadband contributes to an improvement in productivity resulting from the adoption of more efficient business processes. For example, improved marketing of excess inventories and optimization of the supply chain are two of the effects that might be generated. Second, faster connectivity yields an acceleration of the rate of introduction of new products, services, and the launch of innovative business models. An early study that assessed the impact of broadband speed on GDP (Rohman and Bohlin, 2012) looked at 33 OECD countries and concluded that a 100% increase (or doubling) of speed yields a 0.3% increase in GDP. Following on this study, Kongaut and Bohlin (2014) used a similar approach but differentiated between high and low-income OECD countries and determined that an increase in broadband speed of 1% yields an increase in GDP per capita of 0.1% for low-income countries and 0.06% for high income countries³¹. In another example, in their study of the United States Carew et al. (2018) concluded that a 1% increase in speed equates to a 0.0197% in real GDP.

Early macro studies on “old” broadband already established sizable growth effects, and they remain informative for calibrating the order of magnitude. Using OECD country data, Czernich et al. (2011) reported that the introduction of wireline broadband contributed 2.7–3.9% to GDP per capita and that a 10-percentage-point increase in adoption raised annual GDP per-capita growth by 0.9–1.5 percentage points. These results, echoed in subsequent cross-country papers summarized in the recent literature, motivate treating broadband quality (speed) as a productivity-enhancing input in augmented production functions, while focusing identification on adoption rather than availability.

³¹ Another area of broadband economic impact is the contribution to consumer surplus, defined as the amount that consumers benefit from purchasing a product for a price that is less than what they would be willing to pay. Most studies of consumer surplus derived from faster speed are based on surveys or focus groups where consumers stipulate the amount they would be willing to pay for a service such as broadband (Savage et al. (2004); Greenstein and McDewitt (2011); Liu et al. (2018)). Other studies that lack access to survey data tend to rely on pricing differences to estimate consumer surplus (Greenstein and McDewitt, 2011; Greenstein and McDewitt, 2012). Finally, other studies on consumer surplus focus on how consumers’ data usage reacts to variations in price. For example, Nevo et al. (2015) studied hour-by-hour Internet usage for 55,000 US subscribers facing different price schedules. They concluded that consumers would pay between \$0 to \$5 per month for a 1 Mb/s increase in connection speed, with an average of \$2. However, with the availability of more content and applications, consumers will likely increase their usage, implying greater time savings and a greater willingness to pay for speed.

When speed is measured directly, meso-level evidence quantifies the elasticity of output with respect to faster connections. In a balanced panel of 401 German counties (2010–2015), Briglauer, Dürr, and Gugler (2021) estimate that a one-megabit-per-second increase in average advertised bandwidth raises regional GDP by 0.18%, with the effect nearly doubling to 0.31% once spatial spillovers into neighboring counties are internalized—consistent with agglomeration and input-output linkages that propagate local gains. The study also detects diminishing marginal returns to speed, implying an interior optimum (well below “headline” targets) from a regional-growth perspective, and finds larger elasticities in rural counties, which is pertinent for closing urban-rural digital divides.

The significance of broadband speed is not isolated to the German context and is further substantiated by evidence of its impact on firm-level performance. Canzian et al. (2019), for example, found that advances in DSL technology speed in Italy were directly associated with increases in firms' revenue and total factor productivity. Similarly, Hasbi (2020) showed that the deployment of high-speed broadband in French municipalities positively impacted the creation of new companies across non-primary sectors. This micro-level evidence complements the regional GDP findings, illustrating that faster connectivity acts as a catalyst for business growth and dynamism.

Finally, a recent cross-country econometric work by Katz et al. (2024) sought to isolate the specific impact of service quality on economic output. To address the high correlation between download speed and latency, the study employed Principal Components Analysis to create a unified "quality" construct for its model, using data from 63 countries between 2019 and 2022. The results provide a direct elasticity estimate, finding that a 10% increase in download speed is associated with a 0.196% increase in GDP per capita. This quantification offers a current benchmark for evaluating the economic returns of infrastructure upgrades aimed at improving network performance, complementing the findings from earlier regional and firm-level studies.

Research conducted in the United States recently has begun to provide evidence of a positive contribution of high-speed broadband, including in rural areas. Using a panel of counties in the state of Tennessee, Lobo et al. (2020) found that unemployment rates are lower in counties where higher-speed services (above 100Mbps) are available, and that effects are larger in rural counties. Using a similar panel data strategy, Deller et al. (2021) found that broadband availability generally boosts new business formation in non-metro U.S. counties, and that the effect increases with faster broadband speeds (above 50Mbps).

Overall, the review of the existing literature leads us to conclude on the evidence of the causal effect of broadband on the economic performance in the United States (see Table IV-2).

Table IV-2. United States: Summary of Prior Research Evidence of broadband economic spill-over impact

Time period	Research	Time frame	Effects of broadband
1995-2005	Lehr et al. (2006)	2000-2002	• Positive effect of on employment, on the number of businesses, and on property values • No significant effect on wages
	Crandall et al. (2007)	2003-2005	• Positive effect on output and employment only in service industries
	Kandilov and Renkow (2010)	2002-2003	• No significant economic development effect in rural areas (measured by employment, payroll, and the number of business establishments)
	Kolko (2012)	1999-2006	• Positive effect of broadband on employment, although estimates might be upwardly biased
	Mack and Rey (2014)	2004	• County broadband availability stimulated the number of knowledge-intensive firms
	Forman et al. (2012)	1995-2000	• Positive effect of Internet investment on wages and employment only for a reduced number of counties characterized by intensive usage of IT and high skills, income, and population density
2000-2010	Whitacre et al. (2014)	2001-2010	• Median household income, employment, and the number of firms increased faster in counties with higher broadband adoption, and lower unemployment • Higher download speed is associated with less poverty and more creative class employment
	Mack and Faggian (2013)	2000-2007	• Positive impact on productivity only in territories with high levels of human capital and/or highly skilled occupations
	Mack (2014)	2010	• The availability of high-speed broadband is an important determinant of rural firm location
2010-2015	Ford (2018)	2013-2015	• No significant effect of higher broadband speed on economic outcomes, including jobs, earnings, and total personal income
	Lobo et al. (2020)	2011-2015	• Unemployment rates are lower in counties where higher-speed services (above 100Mbps) are available, and that effects are larger in rural counties
	Deller et al. (2021)	2014	• Broadband availability generally boosts new business formation in non-metro U.S. counties, and the effect increases with faster broadband speeds (above 50Mbps)
2010-2020	Katz and Jung (2021)	2010-2020	• During the Covid-19 pandemic, countries with at least 90% fixed broadband adoption experienced 21% less GDP contraction than countries with low adoption rates (equal to 30% or less). An increase in mobile broadband adoption by 10% increases GDP per capita by 2.04% (in low-income countries) and by 1.62% (in middle-income countries).
	Katz and Jung (2022)	2016-2020	• If states had higher broadband adoption, GDP would have contracted only 1% in 2020 because of the lockdowns, a much softer recession than the actual 2.2%.

Source: Compiled by Telecom Advisory Services analysis

The research summarized in Table IV-2 confirms the significant economic impact derived from broadband adoption. However, as penetration rates approach saturation in the United States, the focus of economic impact analysis is shifting from the quantity of connections to the quality of the service. A primary component of

service quality is download speed, as faster connectivity enables more advanced applications and unlocks greater productivity gains.

* * * * *

To sum up, the literature of communications economic impact concludes that the impact of reduced taxation proceeds along two paths. On one hand, a reduction in taxation would result in an increase in communications investment, with the consequent effect in network construction employment and output. This effect comprises: a) additional direct jobs and output (defined as employment and economic production generated in the short term in the course of deployment of network facilities), b) indirect jobs and output (understood as employment and production generated by indirect spending in industrial sectors such as metal products, and electrical equipment), and c) induced jobs and output (which results from household spending based on the income earned from direct and indirect effects). In addition, once additional networks are being deployed, they yield enhanced positive externalities in terms of spillover effects on GDP and employment, although at high penetration levels, such as the one currently existing in the United States, spillovers due to additional penetration tend not to materialize, and increase in network speed becomes the relevant driver. This impact materializes through two main effects: an increase in business productivity via more efficient processes, and an acceleration in the introduction of new products and innovative business models. As reviewed, multiple studies quantify this relationship, confirming that increases in broadband speed have a positive and measurable effect on GDP growth.

V. ECONOMIC IMPACT OF LOWERING TAXES ON COMMUNICATIONS NETWORK INVESTMENT

In order to estimate the economic impact of reduced taxation at the national level, we first calculate what the additional investment in communications would be as a result of alternative taxation scenarios. Once we define these scenarios and we calculate additional investment based on the econometric models specified in Chapter III, we estimate first the impact of the increased investment of network deployment on employment and output (the “construction” effect) and then move to spillovers.

Before quantifying the investment impact of tax reduction scenarios, it is crucial to introduce a discount regarding the application of sales tax to communications equipment. Not all capital expenditures are subject to a communications equipment sales tax; a significant portion consists of non-taxable spending. Based on industry data, this analysis assumes that only 80% of wireless network investment and 60% of wireline and cable network investment constitutes a taxable base of equipment purchases. While our econometric model correctly correlates the total investment increase with tax policy changes, the direct fiscal impact—the actual amount of tax savings for operators—is calculated based on this smaller taxable investment portion. As the following analysis will show, this reveals a powerful incentive effect: the total new capital deployed is a multiple of the actual tax dollars saved, underscoring that tax relief stimulates investment far beyond the value of the tax cut itself. This discount is extremely conservative since it would be reasonable to assume that a reduction in taxable spending is expected to positively affect the non-taxable amount.

V.1. Defining alternative taxation scenarios

To estimate the impact of investment on employment and GDP, our estimation is based on the coefficient of impact of tax rate on investment level estimated in the econometric models specified in section III.2: as concluded in Chapter III, a decrease of 1 percentage point in this rate (for example, from 5.12% to 4.12%) would increase telecommunications and cable investment by 2.11% across all states.

We calculated the capital investment impact of four scenarios, in which the average sales tax rate for equipment purchasing in both sectors would be reduced to 3.00%, 2.00%, 1.00%, and 0.00%, starting from the actual weighted average of 5.12%. We first estimate the short-term impact (one year) (See Table V-1).

Table V-1. Short-Term (one-year) Incremental Network Investment resulting from changes in Sales Tax Rate (in millions unless indicated)

Reduction in average sales tax rate	Total Investment Growth	Total Additional Investment
2024 Total investment: \$ 51,147		
2024 Total taxable investment: \$35,413		
3.00%	4.47%	\$ 1,582
2.00%	6.57%	\$ 2,327
1.00%	8.68%	\$ 3,072
0.00%	10.78%	\$ 3,818

Source: Telecom Advisory Services analysis

According to the data in Table V-1, we estimate that if sales taxes were to be reduced to an average of 3.00% from 5.12%, it would generate an additional investment of \$1,582 million. Alternatively, if sales taxes were eliminated in all states, total communications network investment would increase by \$3,818 million. This means that, propelled by the incentive effect identified in the research literature reviewed in Chapter II, operators would invest beyond the supply of funds benefit of tax decrease (an effect that duplicates, a multiplier of 2.11, the reduction in taxes).

The results in Table V-1 detail the initial one-year impact of the proposed tax reductions. However, capital investment decisions often have multi-year horizons, and there is substantial evidence of CAPEX reduction effect persistence over time. According to this, the econometric model in Table III-4 includes lagged investment variables for one and two prior periods, which improves the model's overall specification and explanatory power. While the coefficients for these lagged variables are positive, aligning with the theory of investment inertia, they do not reach statistical significance in this analysis. Therefore, to provide a conservative forecast, we do not use a model-based estimate for these potential follow-on effects.

V.2. Economic impact of alternative taxation scenarios

Having calculated the impact on communications network investment of a reduction in sales taxes on initial equipment purchase, we then estimate the economic effect on incremental GDP and job creation. According to the research literature reviewed above, those effects can be estimated both in terms of the direct and indirect impact resulting from network deployment (e.g., construction) and in terms of economic spillovers of the infrastructure already deployed.

V.2.1. Assessment of Construction Effects

We conducted the assessment of the direct, indirect and induced impact of additional investment on telecommunications and cable construction by relying on Input / Output tables (based on 2023 data³²), which allows us to estimate, as a result of multipliers, the impact throughout the economy of additional investment in one sector ³³. According to this, an elimination of sales taxes that 35 states currently

³² The input-output table is sourced from Bureau of Economic Analysis from 2023.

³³ See methodology in appendix A.

collect on initial equipment purchase by telecommunications and/or cable service providers would generate 27,431 jobs and \$4.58 billion in value added (GDP) in the first year (considering the direct, indirect and induced effect)³⁴ (See Table V-2).

Table V-2. Decomposition of First-Year Economic Impact from Eliminating the Sales Tax

Effect	Value Added (US\$ Millions)	Employment	Total Industry Output (US\$ Millions)
Direct Effect	\$2,093	12,463	\$3,818
Indirect Effect	\$1,530	7,803	\$3,365
Induced Effect	\$960	7,165	\$1,742
Total Effect	\$4,583	27,431	\$8,925
Multiplier	2.190	2.201	2.338

Source: Telecom Advisory Services analysis

Effects would, obviously, vary according to the four cases of sales tax changes defined above (from lowering the average rate to 3% to completely eliminating it). Table V-3 presents the range of short-term estimates for network construction effects.

Table V-3. Direct, Indirect and Induced Short-Term Output Effect of Changes in Sales Tax on Network Equipment Purchasing (all US\$ figures in Millions)

Reduction in average sales tax rate	Direct Output Effect	Indirect Output Effect	Induced Output Effect	Total Output Effect	Jobs
3.00%	\$1,582	\$1,394	\$722	\$3,698	11,366
2.00%	\$2,327	\$2,051	\$1,062	\$5,440	16,718
1.00%	\$3,072	\$2,707	\$1,402	\$7,181	22,071
0.00%	\$3,818	\$3,365	\$1,742	\$8,925	27,431

Note: The number of jobs is presented as jobs year

Source: Telecom Advisory Services analysis

Table V-3 details the total economic output generated by the increased investment across the economy. However, a more precise measure of the direct contribution to GDP is Value Added. This metric is crucial as it avoids the double-counting of intermediate goods and services inherent in the total output figure, thereby isolating the new wealth created. The following table presents the breakdown of the impact specifically on Value Added, offering a direct estimate of the contribution to GDP under each tax reduction scenario (see Table V-4).

³⁴ For eight states (see Appendix B for the full list), the analysis is based on partial capital expenditure (CAPEX) data due to incomplete reporting. As a result, the national economic impact figures presented should be considered a conservative estimate, as the total potential increase in jobs and GDP would likely be higher if complete data for these states had been available.

Table V-4. Direct, Indirect and Induced Short-Term Value-Added Effect of Changes in Sales Tax on Network Equipment Purchasing (all US\$ figures in Millions)

Reduction in average sales tax rate	Direct Value Added Effect	Indirect Value-Added Effect	Induced Value Added Effect	Total Value-Added Effect
3.00%	\$867	\$634	\$398	\$1,899
2.00%	\$1,275	\$933	\$585	\$2,793
1.00%	\$1,684	\$1,231	\$773	\$3,687
0.00%	\$2,093	\$1,530	\$960	\$4,583

Source: Telecom Advisory Services analysis

V.2.2. Increase in broadband penetration

In addition to the immediate construction-related effects detailed previously, network investment driven by tax reductions will invariably contribute to the ongoing effort to close the nation's digital divide. However, in the context of today's mature broadband market, the nature of that contribution and how it is measured must be re-evaluated. The assumption reviewed in the literature in Chapter IV, and central to this study's earlier iterations, remains valid: the United States has reached such high levels of fixed broadband deployment that additional investment is unlikely to produce the same large-scale GDP spillover effects associated with connecting entirely unserved populations. Furthermore, with the economy operating near full employment, any employment contribution from increased adoption would likely manifest as a reallocation of labor from other sectors or an opportunity for new entrants to the workforce, rather than a large net increase in national employment.

The critical assumption in our analysis lies in understanding precisely how that investment now materializes itself. The logical premise of past research was that additional deployment would primarily result in an increase in broadband connections in states with low penetration, with a smaller incremental effect in areas already highly penetrated. While intuitive, the latest empirical evidence from the 2019–2024 period compels a more nuanced hypothesis. The digital divide in the United States does no longer support a simple binary reality of the connected versus the unconnected; it reflects a more complex spectrum of availability, speed, quality, and reliability. Therefore, this analysis shifts its focus from merely counting the incremental new lines to assessing the impact of investment on the adoption of higher-speed services. To do this, we have developed a new version of econometric models that move beyond the frameworks used in the 2019 study to test a more nuanced question: what is the elasticity of adoption for different speed tiers, and does this effect vary based on a state's existing level of broadband maturity?

To provide a robust answer, we employ a two-way fixed-effects model that estimates the association between lagged per-capita network investment and broadband adoption at three crucial speed tiers: greater than 10 Mbps, 25 Mbps, and 100 Mbps. This log-log model structure allows us to interpret the results as elasticities—that is, the percentage change in adoption resulting from a one percent change in investment—which is a more appropriate metric for a mature market. A key innovation in this model is the division of states into a "High" baseline adoption

group and a "Low" baseline adoption group, determined by their median adoption rate in 2019. This framework allows for the critical recognition that the impact of investment is not uniform and may differ substantially based on a state's starting point of broadband adoption. The model controls for key economic variables, including median income and unemployment, and incorporates both state and year fixed effects to isolate the investment relationship from underlying state-specific characteristics and national economic trends.

For each speed tier $s \in \{10 \text{ Mbps}, 25 \text{ Mbps}, 100 \text{ Mbps}\}$, we estimate a two-way fixed-effects (TWFE) model:

$$\begin{aligned} \ln(\text{Adoption}_{it}^{(s)}) &= \beta_H^{(s)} \ln(\text{CAPEX}_{i,t-1}) + \beta_{HL}^{(s)} [\ln(\text{CAPEX}_{i,t-1}) \times \mathbf{1}\{Low_i\}] \\ &+ \theta_1 \ln(\text{MedianIncome}_{i,t-1}) + \theta_2 \ln(\text{UnemploymentRate}_{i,t-1}) \\ &+ \gamma_i + \delta_t + \varepsilon_{it}. \end{aligned}$$

- γ_i : state fixed effects; δ_t : year fixed effects.

The principal characteristics of the econometric model are:

- SEs clustered by state to address serial correlation and heteroskedasticity.
- $\ln(\text{Adoption})$ at thresholds >10 , >25 , and >100 Mbps.
- $\ln(\text{CAPEX}_{i,t-1})$ = total network investment (wireless, wireline, cable), deflated to constant dollars, scaled per capita, and lagged one year.
- The Controls (lagged, logged) are median household income and unemployment rate.
- Because Low_i is time-invariant, its main effect is absorbed by γ_i ; consequently, only the interaction with the time-varying regressor is identified, as is standard under TWFE.
- The Low-group "final" elasticity reported equals $\beta_H^{(s)} + \beta_{HL}^{(s)}$, computed with its own standard error from the full variance-covariance matrix

The dataset for this analysis builds upon the same panel of economic and tax variables for 2019-2024 that was utilized for the investment model in Chapter III. This foundational data was supplemented with a comprehensive dataset on state-level broadband connections for three distinct speed tiers. Table V-5 below details the adoption levels at the beginning and end of the analysis period for all 51 states, which provides the basis for estimating the adoption elasticity.

Table V-5. Broadband Adoption by State and Speed Tier (Share of Households, December 2019 & June 2024)

State	>10 Mbps		> 25 Mbps		> 100 Mbps	
	2019	2024	2019	2024	2019	2024
Alabama	66.11	87.10	54.60	83.44	13.38	52.56
Alaska	72.33	91.04	52.57	80.60	16.60	46.64
Arizona	77.52	92.13	69.89	88.27	15.56	55.52
Arkansas	58.03	83.60	44.30	78.22	12.87	55.00
California	84.43	96.20	74.63	93.55	15.37	60.88
Colorado	81.39	99.05	74.17	95.18	9.03	75.71
Connecticut	85.63	95.07	72.57	93.17	21.52	78.80
Delaware	95.04	104.80	91.74	104.80	26.45	95.71
D.C.	88.73	89.13	83.80	88.82	32.39	78.88
Florida	93.27	101.84	81.49	100.01	22.63	72.28
Georgia	77.68	93.69	64.19	90.54	21.57	70.41
Hawaii	97.39	103.27	---	101.43	---	---
Idaho	62.86	96.97	50.00	87.61	11.11	59.94
Illinois	75.34	84.71	60.69	81.11	16.26	62.32
Indiana	70.54	88.11	56.58	84.30	16.38	63.16
Iowa	63.48	86.04	54.39	80.29	13.36	60.89
Kansas	72.63	88.37	58.90	84.32	19.75	57.28
Kentucky	69.11	88.45	58.27	84.49	14.35	51.51
Louisiana	68.20	89.01	56.24	85.08	16.45	49.47
Maine	80.36	948.90	63.93	88.29	3.04	30.73
Maryland	89.48	94.19	83.95	93.63	31.93	82.99
Massachusetts	89.68	95.26	86.89	95.08	19.49	80.92
Michigan	73.70	89.98	61.65	86.86	11.13	57.55
Minnesota	72.19	92.12	64.09	87.69	7.82	62.51
Mississippi	54.53	81.27	37.86	74.29	9.06	59.72
Missouri	67.54	86.16	56.27	81.41	17.47	51.79
Montana	67.52	91.61	56.78	83.44	6.31	30.02
Nebraska	73.39	88.18	61.53	84.50	17.00	55.53
Nevada	83.71	95.69	74.07	92.90	18.29	67.20
New Hampshire	90.98	97.46	83.27	94.74	9.02	77.50
New Jersey	90.35	94.36	87.81	93.99	47.74	86.83
New Mexico	59.10	84.61	48.72	77.94	4.49	53.09
New York	84.34	90.14	79.22	89.15	41.90	59.99
North Carolina	78.94	100.12	71.83	97.64	19.62	54.48
North Dakota	82.39	92.31	76.42	91.38	15.09	85.54
Ohio	74.81	89.54	62.43	86.44	10.76	44.10
Oklahoma	62.57	83.60	51.01	78.55	14.73	53.86
Oregon	76.67	92.54	69.04	89.31	8.31	62.40
Pennsylvania	78.19	88.75	72.08	87.89	19.41	70.83
Rhode Island	90.00	93.14	87.32	93.14	0.00	69.57
South Carolina	79.03	99.66	66.81	96.57	16.02	60.48
South Dakota	77.62	92.48	71.22	91.09	7.56	78.55
Tennessee	73.35	92.13	61.34	89.82	20.83	67.35
Texas	79.31	95.85	68.29	93.06	23.49	64.22
Utah	79.94	105.21	70.42	102.19	14.12	85.02
Vermont	78.46	93.31	63.46	84.01	9.23	68.03
Virginia	79.56	92.48	74.23	91.40	28.31	74.23
Washington	80.86	96.49	73.98	93.31	8.11	72.79
West Virginia	55.25	79.47	45.70	73.37	12.55	53.81
Wisconsin	74.17	89.33	61.66	84.34	7.51	36.26
Wyoming	70.87	92.44	63.91	87.82	3.91	33.19

Source: Internet Access Services Status, FCC, Industry Analysis Division Office of Economics & Analytics

The results of this primary model are presented below (See Table V-6).

**Table V-6. Impact of Network Investment on Broadband Adoption
(Interaction Model)³⁵**

Variable	Interaction Model 10Mbps	Interaction Model 25Mbps	Interaction Model 100Mbps
Ln (CAPEX t-1) for High Group	0.079515*** (0.014487)	0.131057*** (0.025934)	0.197154 (0.128354)
Ln (CAPEX t-1) for Low Group	-0.084164*** (0.022608)	-0.146997*** (0.032420)	-0.142641 (0.128195)
Final Effect Ln (CAPEX t-1) for Low Group ³⁶	-0.004649 (0.017483)	-0.015940 (0.025500)	0.054513 (0.049109)
Ln (Median Income t-1)	0.917999*** (0.247042)	1.011313*** (0.338141)	3.187207*** (1.029072)
Ln (Unemployment Rate t-1)	-0.025560 (0.025143)	-0.028092 (0.043085)	-0.055995 (0.095559)
Constant	-10.026156*** (2.615512)	-11.092855*** (3.577661)	-35.839447*** (10.910352)
Observations	215	215	215
R-squared Adj.	0.9008	0.9137	0.9183
State Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes

NOTE: Stars: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$. SEs in parentheses. Data horizon and sample: 2019–2024.
Source: Telecom Advisory Services analysis

These results present a compelling picture of the impact of additional investment in the broadband landscape. The most striking finding is the clear divergence between the two groups of states. In states that already had high baseline adoption rates ("High Group"), additional network investment is shown to have a positive and statistically significant association with the adoption of services faster than 10 Mbps and 25 Mbps. The elasticities indicate that a 10% increase in per-capita investment is associated with an approximate 0.8% rise in >10 Mbps adoption and a 1.3% rise in >25 Mbps adoption in the following year. This provides strong evidence that in these more mature markets, incremental CAPEX is efficiently converted into tangible outcomes like network upgrades, the deployment of newer customer premises equipment, and targeted marketing that successfully encourages households to adopt faster and more capable service tiers. In sharp contrast, for states with lower baseline adoption ("Low Group"), the short-term elasticity of adoption is statistically indistinguishable from zero for these same speed tiers. This crucial finding does not suggest that investment is ineffective in these regions, but rather that its impact follows a longer timeline. In these areas, initial investment may be focused on foundational backbone or middle-mile infrastructure, and adoption is further hampered by significant demand-side frictions such as affordability, access to

³⁵ In addition to the speed-tier models presented, an alternative specification was estimated using overall broadband adoption (any speed) as the dependent variable. In that model, the final elasticity for the "Low Group" was positive (0.04). While this result was not statistically significant—likely due to the low variance in overall penetration rates within this group during the 2019–2024 period—the positive coefficient is an important signal. It suggests that in these less-mature markets, incremental investment is still primarily focused on closing the basic coverage gap, rather than driving upgrades to higher-speed tiers.

³⁶ Is the sum of the first two coefficients of the econometric model

devices, and digital skills, all of which delay the translation of capital outlays into new household subscriptions³⁷.

To further test the integrity of these findings and ensure that the estimated investment effect is not merely an artifact of unobserved price variations, the model was re-estimated with the inclusion of a state-level broadband price control variable³⁸. By explicitly controlling for price, we can isolate the direct association between capital investment and adoption with a much higher degree of confidence. This enhanced specification serves as a critical robustness check on our primary conclusions (See Table V-7).

Table V-7. Impact of Network Investment on Broadband Adoption (with Price Controls)

Variable	Interaction Model 10Mbps	Interaction Model 25Mbps	Interaction Model 100Mbps
Ln (CAPEX t-1) for High Group	0.089184*** (0.019913)	0.138801*** (0.028951)	0.241100* (0.139646)
Ln (CAPEX t-1) for Low Group	-0.084227*** (0.021659)	-0.145627*** (0.030847)	-0.162968 (0.141968)
Final Effect Ln (CAPEX t-1) for Low Group	0.004957 (0.012750)	-0.006826 (0.019259)	0.078132 (0.070387)
Ln (Price t-1)	-0.026948 (0.033300)	-0.039687 (0.047181)	-0.033463 (0.133208)
Constant	-0.184312 (0.151436)	-0.195786 (0.233667)	-1.847327*** (0.637369)
Observations	210	209	209
R-squared Adj.	0.8776	0.8963	0.9046
State Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes

NOTE: Stars: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$. SEs in parentheses. Data horizon and sample: 2019–2024. Source: Telecom Advisory Services analysis

The inclusion of the price control variable powerfully reinforces the validity of the initial findings. The results from this second model demonstrate that the core conclusion is highly robust. Even after accounting for the influence of price, the positive and statistically significant association between network investment and the adoption of higher-speed tiers in the "High Group" of states not only persists but remains remarkably stable. The elasticities are of a similar magnitude, confirming that new capital expenditure itself, independent of pricing, is a key driver of upgrades and adoption in these more developed markets. The model also continues to show a statistically insignificant short-term effect in the "Low Group" of states, further solidifying the conclusion that a different set of temporal dynamics and demand-side barriers are at play in these regions. In summary, this enhanced, and more granular analysis provides compelling new evidence that the impact of network investment is context dependent. In states with mature broadband markets, policies that stimulate investment, such as the tax reductions analyzed in this report, can be expected to yield a direct and measurable increase in the adoption

³⁷ A portion of this investment is likely directed toward connecting the remaining unserved households. However, as this population is now relatively small, its impact is difficult to isolate and measure as a statistically significant effect in the econometric model.

³⁸ See methodology details for calculating State pricing in Appendix C

of higher-speed services. In states still facing foundational adoption challenges, investment is a critical long-term necessity that, for maximum short-term effect, should be paired with complementary initiatives that address affordability and other demand-side constraints³⁹.

Having established the robust, positive relationship between capital investment and the adoption of higher-speed services in mature markets, we can now quantify the practical impact of a policy change. The following analysis translates the elasticities from our price-controlled model (Table V-7) into a tangible forecast of broadband quality improvements, measured by the number of households upgrading to faster service tiers.

The simulation is based on the scenario of a complete elimination of the sales tax on network equipment, which, as calculated in Table V-1, would generate an additional \$3.82 billion in short-term investment. This total investment is first distributed among the states that currently have a sales tax. The analysis then focuses exclusively on the "High" adoption group of states, as this is where the model identified a statistically significant impact. For these states, we apply the specific elasticities for each speed tier from the robust, price-controlled model in Table V-7 to the projected increase in per-capita investment. This allows us to estimate the number of additional households that would adopt services of at least 10 Mbps, 25 Mbps, and 100 Mbps as a direct result of the tax elimination (See Table V-8)

Table V-8. Increase in broadband quality due to the elimination of network equipment sales tax rate (includes only states with equipment sales tax and with high broadband adoption)

State	Increase of at least 10 Mbps Connections	Increase of at least 25 Mbps Connections	Increase of at least 100 Mbps Connections
California	189,505 (12,925,000)	286,789 (12,568,000)	324,191 (8,179,000)
Delaware	660 (415,000)	1,027 (415,000)	1,630 (379,000)
District of Columbia	3,772 (287,000)	5,849 (286,000)	9,024 (254,000)
Florida	120,646 (8,708,000)	184,403 (8,552,000)	231,507 (6,181,000)
Georgia	42,508 (3,755,000)	63,937 (3,629,000)	86,362 (2,822,000)
Maryland	9,425 (2,204,000)	14,582 (2,191,000)	22,451 (1,942,000)
Massachusetts	34,871 (2,631,000)	54,168 (2,626,000)	80,081 (2,235,000)
New York	90,846 (6,913,000)	139,833 (6,837,000)	163,456 (4,601,000)
North Carolina	13,438 (4,192,000)	20,395 (4,088,000)	19,767 (2,281,000)
Pennsylvania	26,711 (4,646,000)	41,169 (4,601,000)	57,632 (3,708,000)

³⁹ The 'High' adoption group includes the following states: California, Colorado, Connecticut, Delaware, D.C., Florida, Georgia, Maryland, Massachusetts, Nevada, New Jersey, New York, North Carolina, Pennsylvania, Rhode Island, South Carolina, South Dakota, Texas, Utah, Virginia, and Washington.

State	Increase of at least 10 Mbps Connections	Increase of at least 25 Mbps Connections	Increase of at least 100 Mbps Connections
South Carolina	36,328 (2,063,000)	54,785 (1,999,000)	59,601 (1,252,000)
South Dakota	3,553 (332,000)	5,446 (327,000)	8,158 (282,000)
Texas	35,196 (10,301,000)	53,181 (10,001,000)	63,752 (6,902,000)
Utah	9,732 (1,152,000)	14,713 (1,119,000)	21,262 (931,000)
USA	617,189 (123,620,000)	940,276 (114,968,000)	1,148,874 (80,511,000)

NOTE: Figures in parentheses represent the total number of broadband connections for each speed tier as of 2024.

Source: Telecom Advisory Services analysis

The results presented in Table V-8 quantify the significant, direct impact of eliminating the sales tax in those states that still apply it in 2024 (to reiterate, these effects only addressed the impact on the high adoption group, since it is the group where the econometric model yields statistically significant coefficients):

- **Contribution to a reduction of the digital divide:** the increase of 617,000 lines of at least 10 Mbps (see first column) represents the adoption of households that did not have a broadband connection or had a line under 10 Mbps (an increase of 0.5% in total lines).
- **Upgrade of speed to FCC :** This entails two parallel effects: (i) a portion of households acquiring service under the 2015 standard of 25 Mbps download/3 Mbps upload migrate to this service tier; (ii) a portion of households acquiring service under the March 2024 FCC standard of 100 Mbps download/20 Mbps upload migrate to this service level (these includes users acquiring broadband at all service levels although they are more likely to be those acquiring service at 50 Mbps download levels). The complete elimination of the sales tax is projected to spur more than 1.1 million households in high-adoption states to upgrade to services of at least 100 Mbps, with over 940,000 adopting speeds of at least 25 Mbps.

These two effects would take place in one year, although it is plausible to consider that, if the tax exemption were to be extended beyond the first year, additional effects would materialize. This demonstrates that pro-investment tax policies not only drive the construction effects detailed earlier but also accelerate the adoption of higher-quality services, a critical factor for economic productivity and digital inclusion.

The economic impact of an increase of 617,000 new adopters can be estimated by relying on the GDP elasticity coefficient of new broadband lines calculated in our prior research conducted for the International Telecommunications Union (2025). Specifically, this analysis employs a GDP elasticity of broadband penetration of 0.1428, a robust coefficient derived from an econometric model developed for the high-income countries in that ITU study. This elasticity measures the percentage increase in GDP that results from a one percent increase in the number of broadband

connections, capturing the macroeconomic spillover effects of network adoption. The calculation proceeds in three steps. First, the incremental growth in broadband connections is determined. The addition of 617,189 new users to the existing base of 123,620,000 total connections in the United States represents an incremental increase of 0.50% in nationwide penetration. Second, this penetration growth is multiplied by the elasticity coefficient ($0.50\% \times 0.1428$) to quantify the total impact, yielding an estimated increase in the national GDP of 0.07%. Finally, this percentage is applied to the U.S. GDP of \$29.180 trillion, which translates into an economic contribution conservatively of approximately \$21 billion in additional GDP⁴⁰. This spillover effect is a direct result of the enhanced productivity and economic activity generated by the new adopters. It quantifies the significant, long-term value created once the new infrastructure is in use, underscoring the multifaceted economic benefits of policies that stimulate broadband deployment and adoption.

As established in the literature review, the upgrades in connection speed are also a direct driver of economic growth, although this is the result of two convergent effects: (i) the increase in lines for adopters of at least 10 Mbps lines, measured as a net increase in the total number of broadband lines of 123,620,000 (0.5%), and (ii) the increase in aggregate speed of service for users migrating for higher service tier lines. Regarding the impact of the increase in higher speed of service lines, while the available FCC data allows for the estimation of the number of households migrating to higher service tiers, it does not provide the granularity needed to determine the precise average increase in speed for these upgrading customers. For example, it is not possible to distinguish between a household upgrading from 30 Mbps to 101 Mbps versus one upgrading from 90 Mbps to 500 Mbps. Without this specific data, applying the speed-to-GDP elasticities from the literature would require making broad assumptions. Therefore, for conservative purposes, this report does not quantify the additional GDP spillover effect resulting from these speed increases, although it is reasonable to expect that such a positive impact exists as well.

These combined findings—spanning increased capital investment, job creation, GDP growth, and tangible improvements in broadband service quality—provide a comprehensive view of the economic benefits of reducing the tax burden on communications infrastructure.

V.3. Conclusion

We estimated models for four cases of average sales tax reduction: 3%, 2%, and 1% and total elimination. For example, if sales taxes were to be reduced to an average of 3.00%, it would generate an additional investment of \$1,582 million in the first year. Alternatively, if sales taxes were completely eliminated in all states, total communications network investment would increase by \$3,818 million. This finding is particularly significant insofar that it demonstrates the importance of tax reduction as a stimulus of network investment. In Table V-10 we present the disaggregation by state for the new investment under the total elimination of the communications sales tax.

⁴⁰ GDP impact (lower bound): \$21B; the model omits the speed effect above 10 Mbps.

Table V-10. Increase in investment by state due to the elimination of network equipment sales tax rate (includes only states with equipment sales tax)

State Name	Investment per capita growth	New Investment
Alabama	14.83%	\$ 89,826,215
Alaska	2.20%	\$ 9,605,502
Arkansas	19.89%	\$ 54,804,415
Arizona	18.63%	\$ 723,401,001
California	16.44%	\$ 145,895,918
Delaware	1.55%	\$ 1,211,534
D.C.	14.74%	\$ 314,624,902
Florida	15.53%	\$ 221,206,514
Georgia	12.69%	\$ 9,649,982
Hawaii	17.46%	\$ 208,164,839
Indiana	12.63%	\$ 62,635,164
Iowa	20.12%	\$ 95,249,239
Kansas	12.63%	\$ 49,841,319
Kentucky	13.16%	\$ 59,596,673
Louisiana	5.20%	\$ 41,576,781
Massachusetts	14.86%	\$ 42,751,975
Maryland	4.38%	\$ 30,031,987
Minnesota	14.67%	\$ 25,005,950
Missouri	17.35%	\$ 44,321,425
Montana	16.04%	\$ 26,092,935
North Carolina	2.92%	\$ 38,053,121
New Mexico	18.92%	\$ 65,021,000
New York	14.74%	\$ 5,762,205
North Dakota	7.81%	\$ 43,553,446
Ohio	12.86%	\$ 6,152,951
Oregon	12.00%	\$ 507,505,664
Pennsylvania	5.96%	\$ 19,030,585
South Carolina	19.74%	\$ 757,838,064
South Dakota	12.00%	\$ 66,690,909
Tennessee	11.45%	\$ 15,022,010
Texas	3.83%	\$ 2,678,159
Utah	9.47%	\$ 11,589,352
Vermont	11.58%	\$ 11,142,395
West Virginia	14.82%	\$ 4,995,533
Wisconsin	13.39%	\$ 7,381,070
USA	10.78%	\$ 3,817,910,733

Source: Telecom Advisory Services analysis

In summary, this chapter quantified the significant and immediate impact of sales tax reductions on communications network investment, yielding macroeconomic effects. Our models show a direct stimulus effect, with a complete elimination of existing sales taxes projected to generate \$3.82 billion in additional capital investment. It is crucial to note that all subsequent economic benefits calculated in this report are based solely on this first-year impact. This represents a conservative forecast, as it does not quantify the potential compounding benefits in subsequent years (which could reach another \$3.82 each additional year). Capital investment decisions often have multi-year horizons, and as discussed, a sustained tax reduction would likely maintain this positive investment climate over time.

This initial, one-year increase in capital expenditure translates into substantial and multifaceted economic benefits. The investment would contribute \$4.58 billion to the national GDP (Value Added) and support over 27,500 jobs through direct, indirect, and induced construction effects in the first year alone.

Beyond this macroeconomic impact of broadband line deployment, the investment allows for the connection of 617,000 households with service of at least 10 Mbps. This translates into \$21 billion of additional GDP.

Finally, over 1.1 million households in mature markets would upgrade to services of at least 100 Mbps as a direct result of this single-year investment, with an economic impact resulting in a broadband speed increase, albeit difficult to estimate.

These findings demonstrate that reducing the tax burden on communications infrastructure is a powerful tool for driving immediate economic growth, creating employment, and improving the digital services essential to modern life, with the potential for sustained benefits if the policy is maintained.

CASE STUDIES

- **FLORIDA**
- **GEORGIA**
- **KENTUCKY**
- **LOUISIANA**
- **OKLAHOMA**
- **TENNESSEE**
- **TEXAS**
- **WISCONSIN**

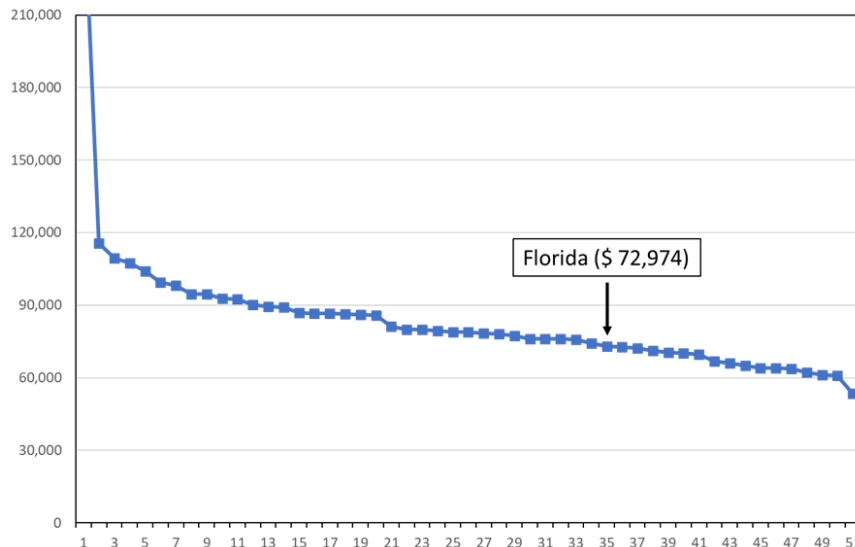
VI. THE ECONOMIC CONTRIBUTION OF COMMUNICATIONS NETWORK INVESTMENT IN FLORIDA

Having established at a national level that a reduction in sales taxes on the acquisition of initial communications network equipment has a substantial economic impact, this chapter now addresses the implications of this finding for the state of Florida. The purpose is to quantify the specific effects that such a fiscal reform would have on the state's economy.

VI.1. The economy of Florida

The state of Florida represents one of the most significant and dynamic economies in the United States. Its economic performance, when measured on a per capita basis, provides a crucial indicator of its standing and trajectory. As of 2024, Florida's GDP per capita reached \$72,974, placing it 35th in the nation (see graphic VI-1).

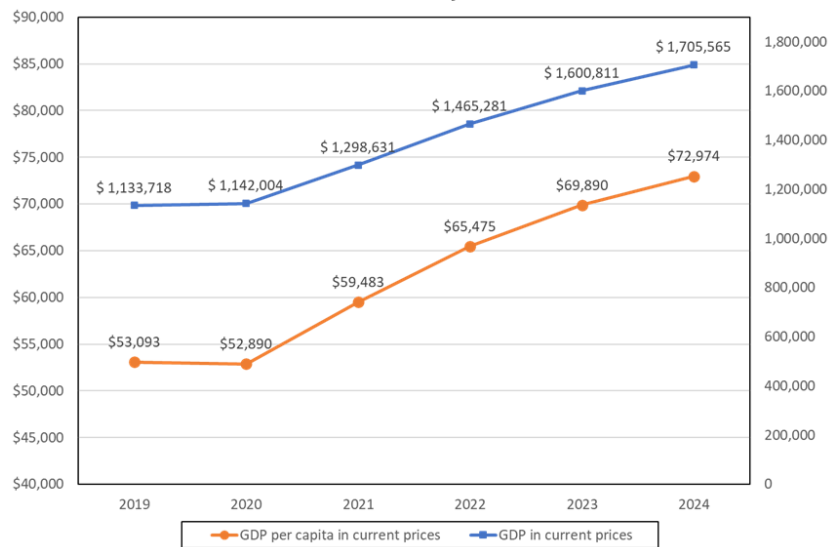
Graphic VI-1. United States: States Ranking by GDP per Capita (2024)



Sources: US Bureau of Economic Analysis; Telecom Advisory Services analysis

While its ranking is noteworthy, the state's recent growth trajectory offers a more compelling narrative of its economic vitality. Between 2019 and 2024, Florida's economy exhibited a remarkable expansion. During this period, the state's total GDP grew from approximately \$1.13 trillion to over \$1.70 trillion. This surge was mirrored in its per capita figures, which experienced an impressive increase of 37.44% over the same period. This vigorous and sustained growth underscores the robustness and expansionary capacity of its productive structure (see graphic VI-2).

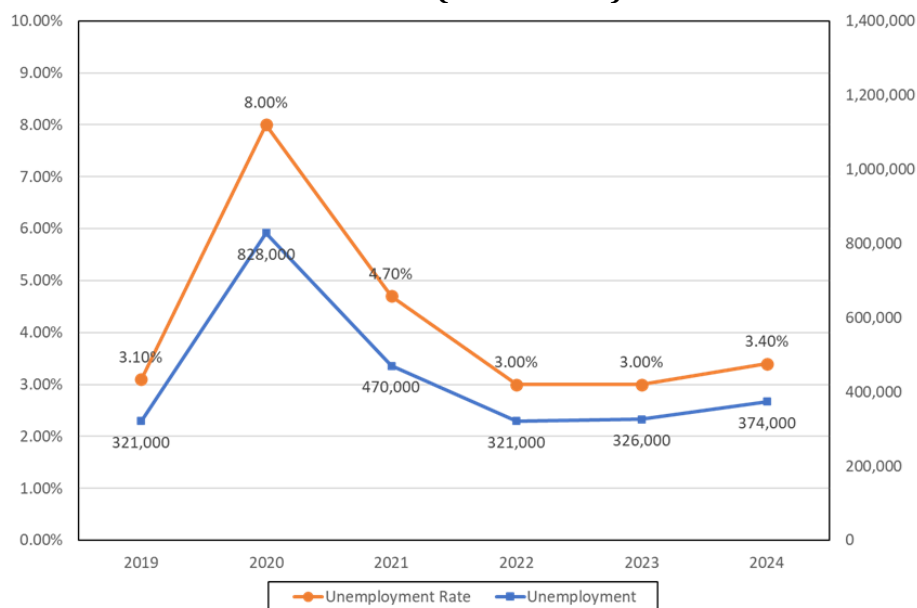
Graphic VI-2. Florida: Gross Domestic Product and GDP Per Capita (2019-2024)



Sources: US Bureau of Economic Analysis; Telecom Advisory Services analysis

An analysis of the labor market complements this view of a resilient economy, illustrating its ability to navigate significant macroeconomic challenges. Florida's unemployment rate has shown notable fluctuation, reflecting both national economic cycles and the state's recovery capabilities. After reaching a low of 3.10% in 2019, the rate saw a dramatic increase to 8.00% in 2020, a phenomenon largely attributable to the economic disruption caused by the pandemic. However, the labor market demonstrated a strong capacity for recovery, with the rate rapidly descending in subsequent years to stabilize at a healthy 3.40% by 2024 (see graphic VI-3).

Graphic VI-3. Florida: Unemployment Rate and Number of Unemployed Workers (2019-2024)



Sources: US Bureau of Labor Statistics; Telecom Advisory Services analysis

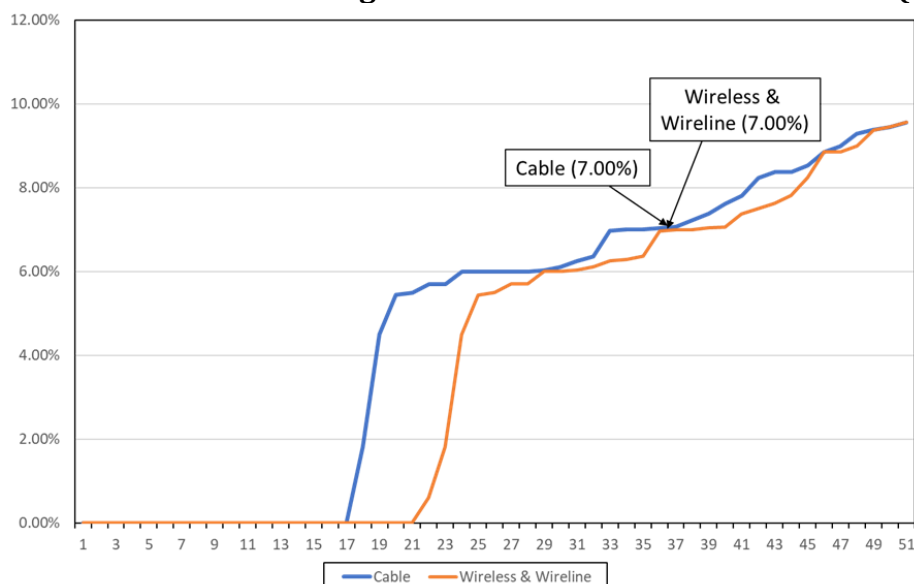
In this context of sustained growth and a stabilized labor market, the analysis of fiscal policies that encourage investment in critical infrastructure becomes particularly pertinent. The evaluation of taxation regimes on communications equipment is crucial for determining how to further enhance economic growth and job creation within the state.

Florida ranks 7th in the US for internet coverage, speed and availability. According Broadband Now 97.5% of Floridians are able to purchase a fixed broadband line of at least 25 Mbps download and 3 Mbps upload, while 96.3% have access to 100 Mbps broadband service. That said, in twenty-nine rural counties, 29% of households access the internet with no subscription or have no internet access. Florida's Broadband Plan, enacted in June 2022 focuses on increasing broadband availability, and use through local and regional partnerships.⁴¹ In light of this initiative, it is relevant to examine the impact that the current taxation regime on broadband equipment acquisition might have on meeting this goal.

VI.2. Current taxation regime on initial equipment purchasing by telecommunications and cable service providers in Florida

Florida is one of 30 states that applies a sales tax to the purchase or use of telecommunications network equipment and one of 34 states that collects a tax on cable network equipment. In 2024, both cable operators and telecommunications service providers were subject to a combined state and local sales tax rate of 7.00%. This positions Florida's tax environment as relatively high compared to the rest of the nation. When ranked among all states, Florida places 37th for the tax rate affecting both telecommunications and cable network investment, indicating a heavier tax burden than most other states (see Graphic VI-4).

Graphic VI-4. Florida: Ranking in US Sales Tax Rate on Investment (2024)



Sources: Tax Foundation; Telecom Advisory Services analysis

⁴¹ Taglang, K. (2022). *Adoption is at the heart of Florida's broadband internet policies*. Benton Institute for Broadband and Society Retrieved in: <https://www.benton.org/blog/adoption-heart-florida-broadband-internet-policies>

The relationship between this tax policy and capital investment within the state warrants close examination. An analysis of the period between 2019 and 2024 reveals a dynamic investment climate operating under a consistently high tax burden. While the sales tax rate remained stable, fluctuating minimally between 7.00% and 7.08%, per capita investment exhibited significant volatility. Investment levels began at \$156 per capita in 2019, peaked at \$189 in 2022, and subsequently declined to \$136 by 2024. Although investment decisions are influenced by numerous market factors, a sustained and elevated tax burden acts as a persistent headwind. By increasing the cost of every new deployment, such a tax regime inherently constrains the potential for greater and more sustained capital investment over the long term.

In light of the role that the sales tax on communications equipment may have in constraining investment, we now proceed to quantify the potential economic impact that would result from its elimination within the state.

VI.3. Economic impact of taxation of communications network equipment taxation in Florida

Building upon the national econometric models detailed in Chapter III and V, this section quantifies the potential economic impact of repealing the sales tax on communications network equipment in Florida. The analysis estimates both the immediate, short-term effects on investment and the subsequent contributions to the state's economic output, job market, and broadband service quality.

The primary estimation is derived from the model's coefficient, which indicates that a one percentage point decrease in the sales tax rate stimulates a 2.1% increase in capital investment. As Florida currently levies a 7.00% tax, a complete elimination is projected to generate a substantial surge in network deployment spending. The following table outlines the expected increase in investment under two scenarios: a full elimination of the tax and a 50% reduction. The long-term impact assumes the policy and its stimulus effect are maintained for a second year (see Table VI-1).

Table VI-1. Florida: Estimation of the Increase in Communications Investment Resulting from Changes in the Sales Tax on Network Equipment (*in US\$ millions unless indicated*)

	Year 1	Two-Year Total
Full Elimination of Sales Tax		
Investment Growth	\$ 315	\$ 629
Savings from Sales Tax Elimination	\$ 149	\$ 299
Share of Savings Reinvested	211%	211%
50% Reduction of Sales Tax		
Investment Growth	\$ 157	\$ 315
Savings from Sales Tax Elimination	\$ 75	\$ 149
Share of Savings Reinvested	211%	211%

Source: Telecom Advisory Services analysis

The estimates presented in Table VI-1 highlight a critical finding of this study: the powerful incentive effect of tax reduction. As indicated by the "Share of Savings

Reinvested," the capital deployed by operators is projected to be 211% of the amount saved from the tax itself. This demonstrates that tax relief not only increases the supply of funds available for investment but also enhances the financial attractiveness of deploying capital in Florida relative to other locations, thereby attracting additional investment that more than doubles the value of the tax savings.

This incremental investment, in turn, generates a cascade of positive effects throughout the state's economy. These impacts are categorized into two main areas: the short-term effects from network construction and the direct benefits to consumers through improved broadband quality. The table below summarizes the estimated statewide socioeconomic impact resulting from the first year of increased investment following a full tax repeal (see Table VI-2).

Table VI-2. Florida: Estimation of Socio-Economic Impact of Eliminating Sales Tax on Communications Equipment Purchases

Economic Indicators	Current Level	Estimated Impact 1 Year
GDP Per Capita	\$ 72,974	\$ 72,990
GDP Per Capita Growth	-	0.02%
Incremental Economic Output (\$ million)	-	\$ 735
Incremental GDP (\$ million)	-	\$ 378
Unemployment Rate	3.40%	3.38%
Jobs Year created	-	2,260
Broadband Connections >10 Mbps	8,708,000	8,828,646
Broadband Penetration >10 Mbps	101.84%	103.25%
Broadband Connections >25 Mbps	8,552,000	8,736,403
Broadband Penetration >25 Mbps	100.01%	102.17%
Broadband Connections >100 Mbps	6,181,000	6,412,507
Broadband Penetration >100 Mbps	72.28%	74.99%

Source: Telecom Advisory Services analysis

The economic analysis indicates that eliminating the sales and use tax on communications infrastructure would, in the first year alone, generate:

- \$378 million in incremental Gross Domestic Product and \$735 million in total economic output.
- This activity would support the creation of 2,260 jobs-year, contributing to a tangible reduction in the state's unemployment rate.
- Over a two-year period, the sustained investment is projected to generate over \$1.1 billion in new economic activity (GDP) and create approximately 6,750 jobs-year.

Crucially, in a state with a mature and highly penetrated broadband market like Florida, the impact of new investment manifests significantly in service quality upgrades and potentially the expansion to the still unserved population. The policy change is forecasted to enable over 231,000 households to adopt services of at least 100 Mbps within the first year, raising the state's penetration for this critical tier by nearly three percentage points⁴². This shift toward higher speeds is not merely an

⁴² This upgrade is particularly significant as Florida's broadband market is already saturated at lower speed tiers, with penetration for both >10 Mbps and >25 Mbps services exceeding 100% in 2024.

incremental improvement; it is a fundamental necessity for supporting the advanced digital applications that drive modern commerce, education, and healthcare, thereby securing Florida's long-term economic competitiveness.

The findings from Chapter IV underscore that the productivity benefits associated with this investment are broadly distributed. The enhanced infrastructure directly benefits Florida's entire economic ecosystem—from wholesale trade and professional services to finance and healthcare—creating a virtuous cycle of growth. Consequently, the initial reduction in sales tax collections should not be viewed as a net loss to the treasury. Instead, it is an upfront investment that is quickly offset by substantial new revenues generated from increased income, sales, and property taxes resulting from the widespread economic expansion.

In conclusion, eliminating the sales tax on communications equipment is a powerful, pro-growth policy lever. It provides a rare opportunity to generate a significant and immediate return on investment, create high-quality jobs, and deliver direct, tangible benefits to consumers and businesses across the state. By fostering a more competitive investment climate, Florida can accelerate the deployment of next-generation networks, solidifying its position as a leader in the digital economy for decades to come.

The primary opportunity for meaningful improvement now lies in driving adoption of higher-speed services, where the >100 Mbps tier's penetration is substantially lower at 72.28%.

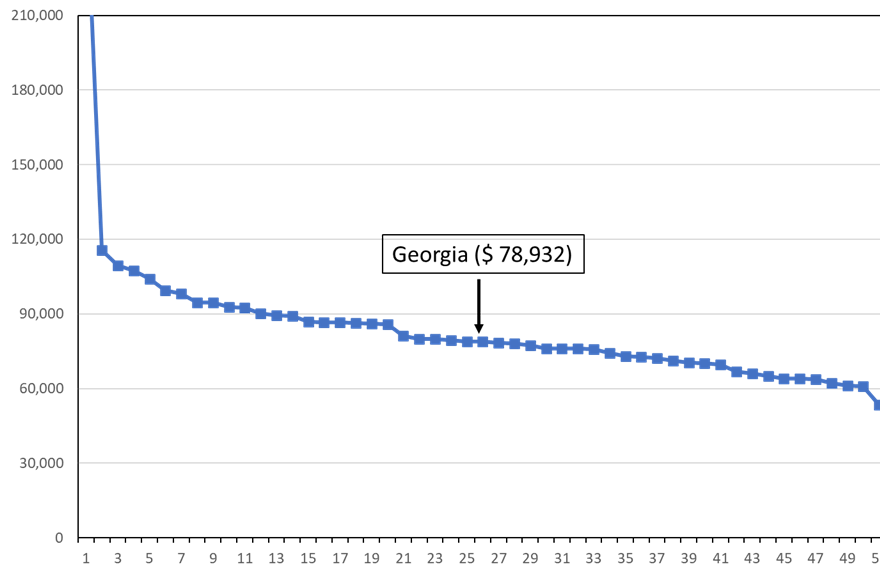
VII. THE ECONOMIC CONTRIBUTION OF COMMUNICATIONS NETWORK INVESTMENT IN GEORGIA

Following the detailed examination of Florida, we now turn to the state of Georgia to provide a comparative analysis of the economic implications of its communications equipment sales tax. This chapter applies the same national framework to quantify the specific effects that a similar fiscal reform would have on Georgia's distinct economic landscape, offering further evidence of the policy's potential impact.

VII.1. The economy of Georgia

The state of Georgia stands as a significant and robust component of the United States economy. Its economic output, when evaluated on a per capita basis, positions it solidly in the upper half of the nation. As of 2024, Georgia's GDP per capita reached \$78,932, placing it 26th nationally and reflecting a strong and productive economic base (see graphic VII-1).

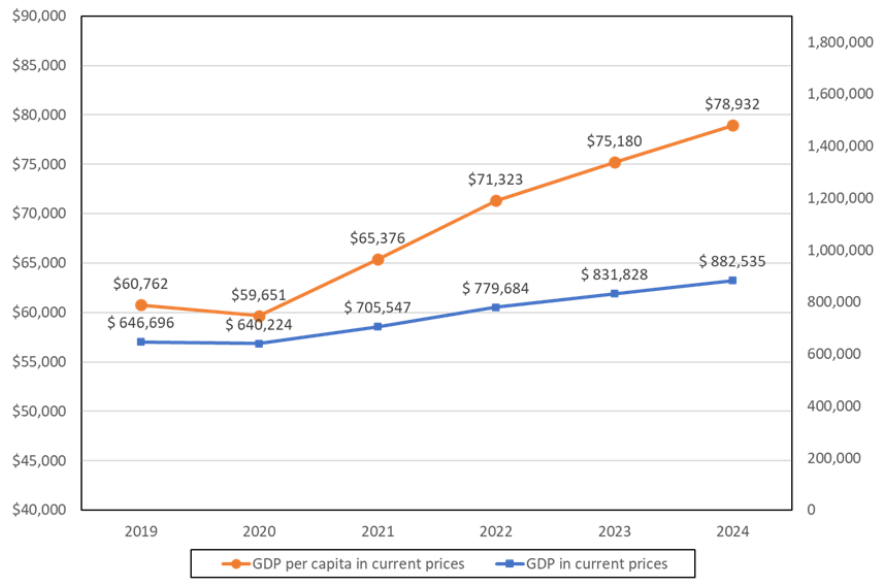
Graphic VII-1. United States: States Ranking by GDP per Capita (2024)



Sources: US Bureau of Economic Analysis; Telecom Advisory Services analysis

While this ranking provides a valuable static snapshot, the state's recent growth trajectory offers a more compelling narrative of its economic vitality. Between 2019 and 2024, Georgia's economy exhibited a remarkable expansion, with its total GDP growing from approximately \$647 billion to over \$882 billion. This surge was mirrored in its per capita figures, which experienced an impressive increase of 29.90% over the same period. This vigorous and sustained growth underscores the robustness and expansionary capacity of its productive structure (see graphic VII-2).

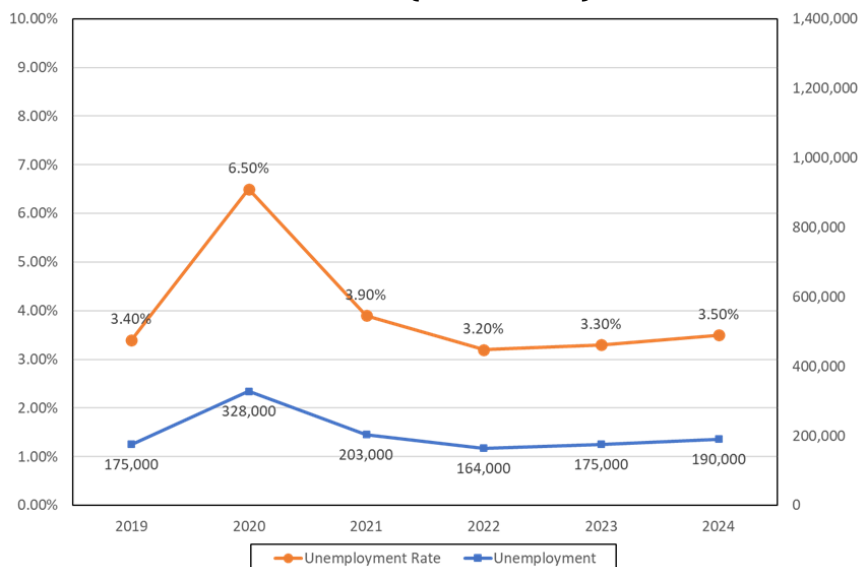
Graphic VII-2. Georgia: Gross Domestic Product and GDP Per Capita (2019-2024)



Sources: US Bureau of Economic Analysis; Telecom Advisory Services analysis

Complementing this narrative of strong output growth is an analysis of the state's resilient labor market, which has adeptly navigated recent macroeconomic challenges. After registering a low unemployment rate of 3.40% in 2019, the state saw a significant increase to 6.50% in 2020 amid the pandemic-induced economic disruption. However, the labor market demonstrated a strong capacity for recovery, with the rate rapidly descending in subsequent years to stabilize at a healthy 3.50% by 2024, showcasing the underlying strength of the state's employment base (see graphic VII-3).

Graphic VII-3. Georgia: Unemployment Rate and Number of Unemployed Workers (2019-2024)



Sources: US Bureau of Labor Statistics; Telecom Advisory Services analysis

In this context of sustained growth and a stabilized labor market, the analysis of fiscal policies that encourage investment in critical infrastructure becomes

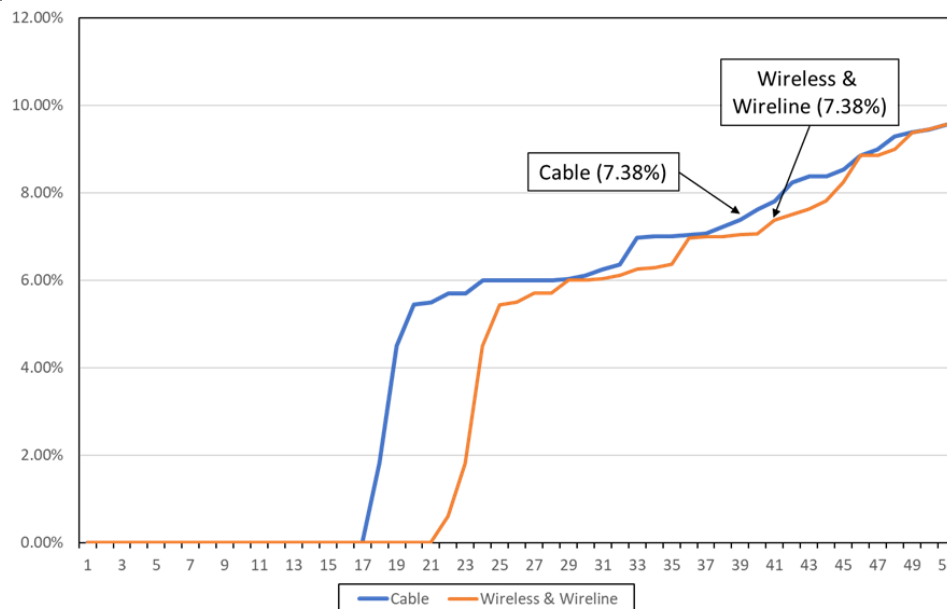
particularly pertinent. The evaluation of taxation regimes on communications equipment is crucial for determining how to further enhance economic growth and job creation within the state.

According to the American Community Survey, 92.3 percent of Georgia residents have a home internet subscription, roughly in line with the national rate of 90.3%, although only 77% have fixed broadband access.⁴³ The Georgia Technology Authority elaborated a Digital Connectivity Plan towards the end of 2023, which outlines as one of its five goals that all Georgians should have access to reliable internet connectivity at home and in their community. It is, therefore, pertinent, to examine whether the current tax framework on initial broadband equipment acquisition is consistent with the overarching goal outline in the Digital Connectivity Plan.

VII.2. Current taxation regime on initial equipment purchasing by telecommunications and cable service providers in Georgia

Georgia is one of 30 states that applies a sales tax to the purchase of telecommunications network equipment and one of 34 states that collects a tax on cable network equipment. In 2024, both cable operators and telecommunications service providers were subject to a combined state and local sales tax rate of 7.38%. This positions Georgia's tax environment as particularly burdensome relative to the rest of the nation. When ranked among all states, Georgia places 39th (Cable) and 41st (Telecom) for its tax rate on network investment, indicating a heavier tax burden than all but a few other states (see Graphic VII-4).

Graphic VII-4. Georgia: Ranking in US Sales Tax Rate on Investment (2024)



Sources: Tax Foundation; Telecom Advisory Services analysis

⁴³ Benton Institute for broadband and society (2023). *Georgia's Plan for digital connectivity* (December). Retrieved in: <https://www.benton.org/blog/georgias-plan-digital-connectivity>

The relationship between this tax policy and capital investment within the state warrants close examination. An analysis of the period between 2019 and 2024 reveals a dynamic investment climate operating under a consistently high tax burden. While the sales tax rate saw a modest but steady increase from 7.29% to 7.38%, per capita investment exhibited significant volatility. Investment levels, which were already high at \$214 per capita in 2019, peaked at an exceptional \$244 in 2022 before declining sharply to \$186 by 2024. Although investment decisions are influenced by numerous market factors, a sustained and elevated tax burden—one of the highest in the nation —acts as a persistent headwind. By increasing the cost of every new deployment, such a tax regime inherently constrains the potential for greater and more sustained capital investment over the long term.

In light of the role that the sales tax on communications equipment may have in constraining investment, we now proceed to quantify the potential economic impact that would result from its elimination within the state.

VII.3. Economic impact of taxation of communications network equipment taxation in Georgia

Building upon the national econometric models detailed in Chapter III and V, this section quantifies the potential economic impact of repealing the sales tax on communications network equipment in Georgia. The analysis estimates both the immediate, short-term effects on investment and the subsequent contributions to the state's economic output, job market, and broadband service quality. The primary estimation is derived from the model's coefficient, which indicates that a one percentage point decrease in the sales tax rate stimulates a 2.1% increase in capital investment. As Georgia currently levies a significant 7.38% tax, a complete elimination is projected to generate a substantial surge in network deployment spending. The following table outlines the expected increase in investment under two scenarios: a full elimination of the tax and a 50% reduction. The long-term impact assumes the policy and its stimulus effect are maintained for a second year (see Table VII-1).

Table VII-1. Georgia: Estimation of the Increase in Communications Investment Resulting from Changes in the Sales Tax on Network Equipment
(in \$ millions unless indicated)

	Year 1	Two-Year Total
Full Elimination of Sales Tax		
Investment Growth	\$ 221	\$ 442
Savings from Sales Tax Elimination	\$ 105	\$ 210
Share of Savings Reinvested	211%	211%
50% Reduction of Sales Tax		
Investment Growth	\$ 111	\$ 221
Savings from Sales Tax Elimination	\$ 53	\$ 105
Share of Savings Reinvested	211%	211%

Source: Telecom Advisory Services analysis

The estimates presented in Table VII-1 highlight a critical finding of this study: the powerful incentive effect of tax reduction. As indicated by the "Share of Savings Reinvested," the capital deployed by operators is projected to be 211% of the amount

saved from the tax itself. This demonstrates that tax relief not only increases the supply of funds available for investment but also enhances the financial attractiveness of deploying capital in Georgia relative to other locations, thereby attracting additional investment that more than doubles the value of the tax savings.

This incremental investment, in turn, generates a cascade of positive effects throughout the state's economy. These impacts are categorized into two main areas: the short-term effects from network construction and the direct benefits to consumers through improved broadband quality. The table below summarizes the estimated statewide socioeconomic impact resulting from the first year of increased investment following a full tax repeal (see Table VII-2).

Table VII-2. Georgia: Estimation of Socio-Economic Impact of Eliminating Sales Tax on Communications Equipment Purchases

Economic Indicators	Current Level	Estimated Impact 1 Year
GDP Per Capita	\$ 78,932	\$ 78,956
GDP Per Capita Growth	-	0.03%
Incremental Economic Output (\$ million)	-	\$ 517
Incremental GDP (\$ million)	-	\$ 266
Unemployment Rate	3.50%	3.47%
Jobs Year created	-	1,589
Broadband Connections >10 Mbps	3,755,000	3,797,508
Broadband Penetration >10 Mbps	93.69%	94.75%
Broadband Connections >25 Mbps	3,629,000	3,692,937
Broadband Penetration >25 Mbps	90.54%	92.14%
Broadband Connections >100 Mbps	2,822,000	2,908,362
Broadband Penetration >100 Mbps	70.41%	72.56%

Source: Telecom Advisory Services analysis

The economic analysis presented herein provides compelling evidence that the elimination of the sales and use tax on communications infrastructure is a strategic investment in Georgia's future. In the first year alone, this policy is projected to generate \$266 million in new Gross Domestic Product and \$517 million in total economic output. This surge in economic activity would support the creation of 1,589 jobs-year, contributing to a tangible reduction in the state's unemployment rate and strengthening the workforce. The sustained impact is even more significant, with a projected two-year creation of over \$520 million in new economic activity (GDP) and approximately 3,200 jobs-year.

Crucially, in a state with a mature and highly penetrated broadband market like Georgia, the impact of new investment manifests significantly in service quality upgrades. The policy change is forecasted to enable over 86,000 households to adopt services of at least 100 Mbps within the first year, raising the state's penetration for this critical tier by more than 1.5 percentage points. This shift toward higher speeds is not merely an incremental improvement; it is a fundamental necessity for supporting the advanced digital applications that drive modern commerce, education, and healthcare, thereby securing Georgia's long-term economic competitiveness.

The findings from Chapter IV underscore that the productivity benefits associated with this investment are broadly distributed. The enhanced infrastructure directly benefits Georgia's entire economic ecosystem—from wholesale trade and professional services to finance and healthcare—creating a virtuous cycle of growth. Consequently, the initial reduction in sales tax collections should not be viewed as a net loss to the treasury. Instead, it is an upfront investment that is quickly offset by substantial new revenues generated from increased income, sales, and property taxes resulting from the widespread economic expansion.

In conclusion, eliminating the sales tax on communications equipment is a powerful, pro-growth policy lever. It provides a rare opportunity to generate a significant and immediate return on investment, create high-quality jobs⁴⁴, and deliver direct, tangible benefits to consumers and businesses across the state. By fostering a more competitive investment climate, Georgia can accelerate the deployment of next-generation networks, solidifying its position as a leader in the digital economy for decades to come.

⁴⁴ An association between broadband access and labor force participation was already raised by Sanchez, A. (2023). *Connecting the economic opportunity: the digital divide in the southeast*. Federal Reserve Bank of Atlanta. Retrieved in: <https://www.atlantafed.org/community-development/publications/partners-update/2023/08/17/connecting-to-economic-opportunity-the-digital-divide-in-the-southeast>

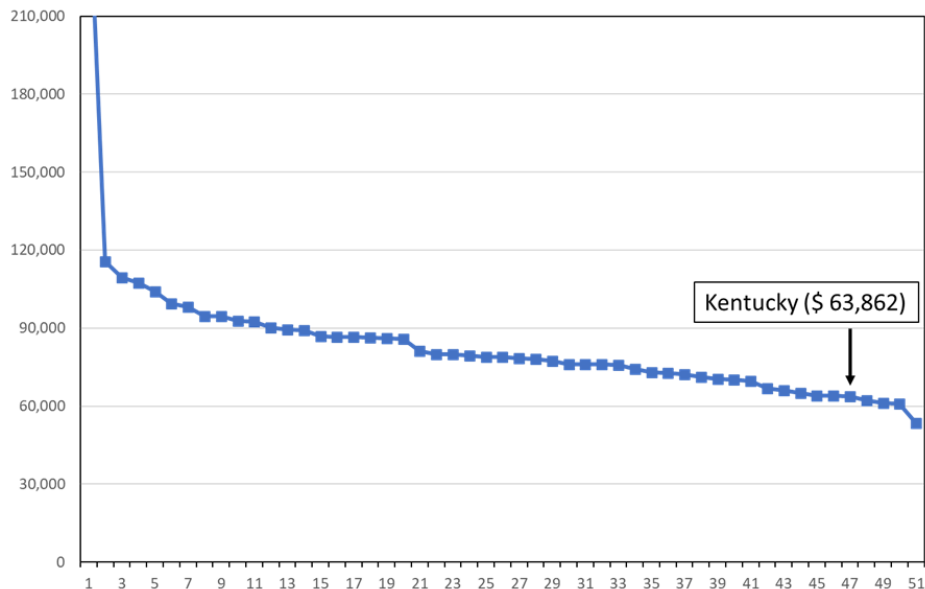
VIII. THE ECONOMIC CONTRIBUTION OF COMMUNICATIONS NETWORK INVESTMENT IN KENTUCKY

This chapter applies the established national framework to quantify the specific effects that a fiscal reform would have on Kentucky's unique economic landscape, thereby broadening the evidence base for the policy's potential impact across diverse economic environments.

VIII.1. The economy of Kentucky

The state of Kentucky presents a unique economic profile within the United States. Its economic output, when evaluated on a per capita basis, places it in the lower quartile of the nation. As of 2024, Kentucky's GDP per capita reached \$63,862, ranking it 47th nationally. This position underscores the critical importance of pro-growth policies to enhance its economic standing (see graphic VIII-1).

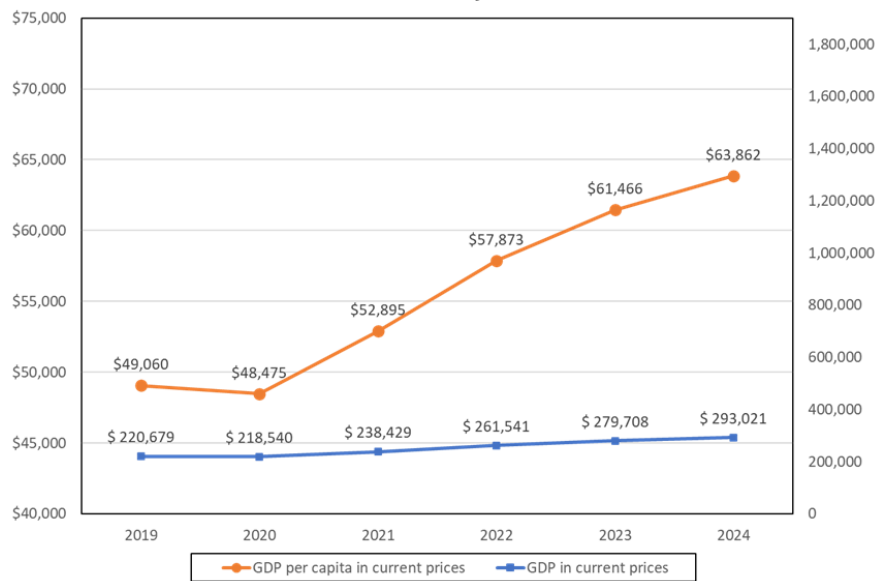
Graphic VIII-1. United States: States Ranking by GDP per Capita (2024)



Sources: US Bureau of Economic Analysis; Telecom Advisory Services analysis

Despite its lower ranking, the state's recent growth trajectory offers a compelling narrative of upward momentum. Between 2019 and 2024, Kentucky's economy exhibited a remarkable expansion, with its total GDP growing from approximately \$221 billion to over \$293 billion. This surge was mirrored in its per capita figures, which experienced an impressive increase of 30.17% over the same period. This vigorous growth demonstrates a significant underlying potential and highlights the opportunity to accelerate this progress through strategic policy interventions (see graphic VIII-2).

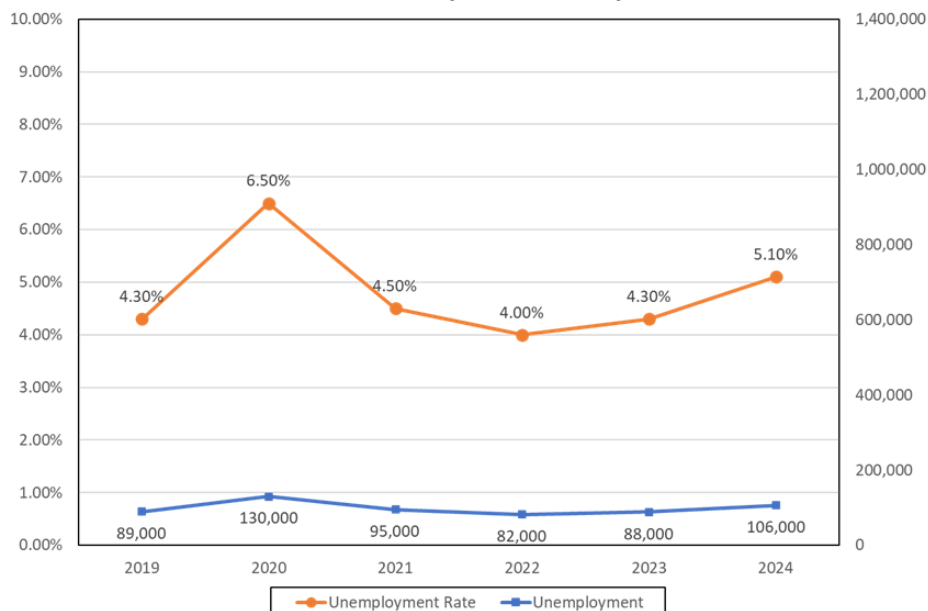
Graphic VIII-2. Kentucky: Gross Domestic Product and GDP Per Capita (2019-2024)



Sources: US Bureau of Economic Analysis; Telecom Advisory Services analysis

However, an analysis of the state's labor market reveals persistent challenges. After a sharp increase to 6.50% in 2020, the unemployment rate has remained elevated, settling at 5.10% in 2024—a figure notably higher than that of many other states. This underscores the need for policies that not only foster GDP growth but also directly stimulate job creation to address the slack in the labor market (see graphic VIII-3).

Graphic VIII-3. Kentucky: Unemployment Rate and Number of Unemployed Workers (2019-2024)



Sources: US Bureau of Labor Statistics; Telecom Advisory Services analysis

In this context of strong growth potential tempered by a challenging labor market, the analysis of fiscal policies that encourage investment in critical infrastructure becomes particularly pertinent.

The American Community Survey estimated that in 2024, 91% of households in Kentucky had an Internet subscription of any type. Furthermore, according to the June 2023 FCC broadband map 13.9% (or 259,258) of Broadband Serviceable Locations should be considered as unserved, meaning that they lack 25 Mbps download/3 Mbps upload broadband (this places the state in 14th position). The Five-Year Action Plan of the Commonwealth of Kentucky stipulates a vision aimed at providing universal access to affordable, reliable high-speed internet to all families and businesses in the state.⁴⁵ In this context, the evaluation of taxation regimes on purchasing of communications equipment is crucial for determining how to fulfill this vision.

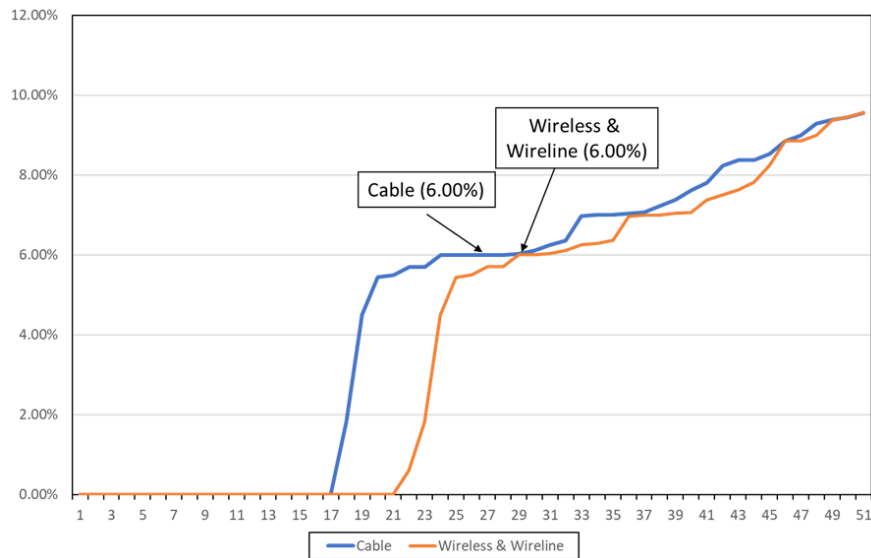
VIII.2. Current taxation regime on initial equipment purchasing by telecommunications and cable service providers in Kentucky

Kentucky's fiscal policy places it among the majority of states that levy a sales tax on communications network equipment. Specifically, it is one of 30 states that applies a sales tax to the purchase of telecommunications network equipment and one of 34 states that collects a tax on cable network equipment. In 2024, both cable operators and telecommunications service providers were subject to a combined state and local sales tax rate of 6.00%. While this rate is lower than that of some other states in this study, it still represents a significant fiscal burden. When ranked among all states, Kentucky places 26th (Cable) and 29th (Telecom) for its tax rate on network investment, indicating a tax environment that is less competitive than more than half the country (see Graphic VIII-4).

In 2024, the state enacted a partial income tax credit for a portion of the sales tax paid on broadband network equipment. However, the impact of this tax credit did not impact purchasing decisions until after 2024 so there is no measurable impact during the time period covered by this analysis.

⁴⁵ Team Kentucky. Office of Broadband Development (2023). Five-Year Action Commonwealth of Kentucky: Broadband Equity, Access and Deployment program (August). Retrieved in: <https://broadband.ky.gov/resources/Documents/KY%20BEAD%205-Year%20Action%20Plan.pdf>

Graphic VIII-4. Kentucky: Ranking in US Sales Tax Rate on Investment (2024)



Sources: Tax Foundation; Telecom Advisory Services analysis

The relationship between this tax policy and capital investment within the state warrants close examination. An analysis of the period between 2019 and 2024 reveals a dynamic investment climate operating under a consistent tax burden. While the 6.00% tax rate remained unchanged, per capita investment fluctuated, peaking at \$170 in 2022 before declining to \$157 by 2024. Although investment decisions are influenced by numerous market factors, a sustained tax burden acts as a persistent headwind. By increasing the cost of every new deployment, such a tax regime inherently constrains the potential for greater and more sustained capital investment over the long term.

In light of the role that the sales tax on communications equipment may have in constraining investment, we now proceed to quantify the potential economic impact that would result from its elimination within the state.

VIII.3. Economic impact of taxation of communications network equipment taxation in Kentucky

Building upon the national econometric models detailed in Chapter III and V, this section quantifies the potential economic impact of repealing the sales tax on communications network equipment in Kentucky. The analysis estimates both the immediate, short-term effects on investment and the subsequent contributions to the state's economic output and job market. The primary estimation is derived from the model's coefficient, which indicates that a one percentage point decrease in the sales tax rate stimulates a 2.1% increase in capital investment. As Kentucky currently levies a 6.00% tax, a complete elimination is projected to generate a substantial surge in network deployment spending. The following table outlines the expected increase in investment under two scenarios: a full elimination of the tax and a 50% reduction. The long-term impact assumes the policy and its stimulus effect are maintained for a second year (see Table VIII-1).

**Table VIII-1. Kentucky: Estimation of the Increase in Communications Investment Resulting from Changes in the Sales Tax on Network Equipment
(in \$ millions unless indicated)**

	Year 1	Two-Year Total
Full Elimination of Sales Tax		
Investment Growth	\$ 63	\$ 125
Savings from Sales Tax Elimination	\$ 30	\$ 60
Share of Savings Reinvested	211%	211%
50% Reduction of Sales Tax		
Investment Growth	\$ 31	\$ 63
Savings from Sales Tax Elimination	\$ 15	\$ 30
Share of Savings Reinvested	211%	211%

Source: Telecom Advisory Services analysis

The estimates presented in Table VIII-1 highlight a critical finding of this study: the powerful incentive effect of tax reduction. As indicated by the "Share of Savings Reinvested," the capital deployed by operators is projected to be 211% of the amount saved from the tax itself. This demonstrates that tax relief not only increases the supply of funds available for investment but also enhances the financial attractiveness of deploying capital in Kentucky relative to other locations, thereby attracting additional investment that more than doubles the value of the tax savings.

This incremental investment, in turn, generates a cascade of positive effects throughout the state's economy. The table below summarizes the estimated statewide socioeconomic impact resulting from the first year of increased investment following a full tax repeal (see Table VIII-2).

Table VIII-2. Kentucky: Estimation of Socio-Economic Impact of Eliminating Sales Tax on Communications Equipment Purchases

Economic Indicators	Current Level	Estimated Impact 1 Year
GDP Per Capita	\$ 63,862	\$ 63,878
GDP Per Capita Growth	-	0.03%
Incremental Economic Output (\$ million)	-	\$ 146
Incremental GDP (\$ million)	-	\$ 75
Unemployment Rate	5.10%	5.08%
Jobs Year created	-	450
Broadband Connections >10 Mbps	1,585,000	-
Broadband Penetration >10 Mbps	88.45%	-
Broadband Connections >25 Mbps	1,514,000	-
Broadband Penetration >25 Mbps	84.49%	-
Broadband Connections >100 Mbps	923,000	-
Broadband Penetration >100 Mbps	51.51%	-

Source: Telecom Advisory Services analysis

The economic analysis presented herein provides compelling evidence that the elimination of the sales and use tax on communications infrastructure is a strategic investment in Kentucky's future. In the first year alone, this policy is projected to generate \$75 million in new Gross Domestic Product and \$146 million in total economic output. This surge in economic activity would support the creation of 450 jobs-year, contributing to a tangible reduction in the state's elevated unemployment rate and strengthening the workforce. The sustained impact is even more significant,

with a projected two-year creation of over \$150 million in new economic activity (GDP) and approximately 900 jobs-year.

Crucially, the nature of Kentucky's digital landscape suggests a unique and vital use for this new capital. Unlike states with near-universal broadband coverage, Kentucky still faces a significant connectivity gap, as evidenced by its lower penetration rates, particularly for high-speed service of 100 Mbps (51.51%). Therefore, the incremental investment spurred by this tax elimination would be strategically channeled not just toward upgrading existing networks, but toward fundamental network expansion. This capital would be essential for building out infrastructure to unserved and underserved communities, directly addressing the digital divide and promoting greater digital equity across the commonwealth.

This shift toward closing the connectivity gap is a fundamental necessity for unlocking the full economic potential of all regions within the state, ensuring that rural and less-connected areas can participate fully in modern commerce, education, and healthcare. The findings from Chapter IV underscore that the productivity benefits associated with this investment are broadly distributed. The enhanced infrastructure directly benefits Kentucky's entire economic ecosystem—from wholesale trade and professional services to finance and healthcare—creating a virtuous cycle of growth. Consequently, the initial reduction in sales tax collections should not be viewed as a net loss to the treasury. Instead, it is an upfront investment that is quickly offset by substantial new revenues generated from increased income, sales, and property taxes resulting from the widespread economic expansion.

In conclusion, eliminating the sales tax on communications equipment is a powerful, pro-growth policy lever. It provides a rare opportunity to generate a significant and immediate return on investment, create high-quality jobs, and deliver direct, tangible benefits to consumers and businesses across the state. By fostering a more competitive investment climate, Kentucky can accelerate the deployment of next-generation networks, bridge the digital divide and solidify its position as a leader in the digital economy for decades to come.

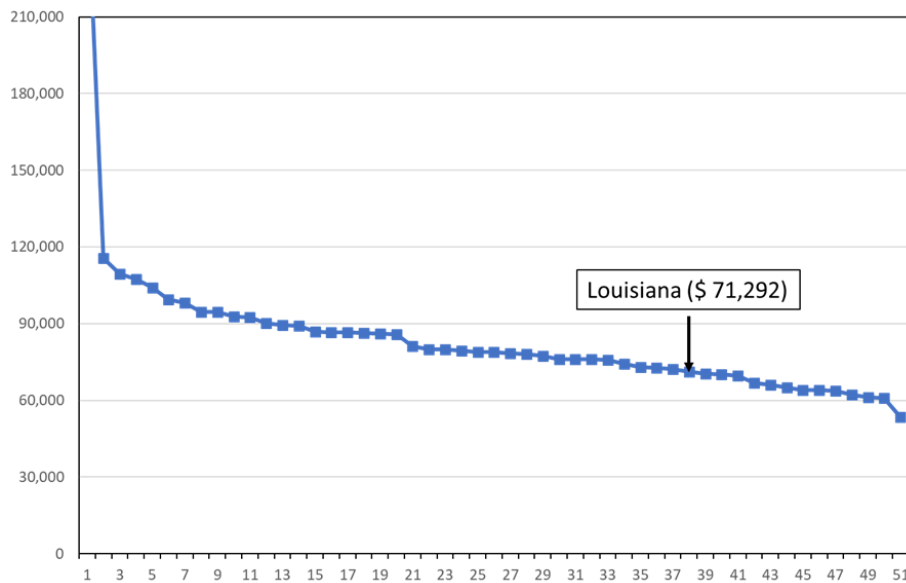
IX. THE ECONOMIC CONTRIBUTION OF COMMUNICATIONS NETWORK INVESTMENT IN LOUISIANA

Continuing the state-by-state analysis, this chapter examines the economic implications of Louisiana's uniquely burdensome communications equipment sales tax. It applies the established national framework to quantify the specific effects that a fiscal reform would have on Louisiana's distinct economic landscape, thereby providing a compelling case study on the impact of high taxation on digital infrastructure investment.

IX.1. The economy of Louisiana

The state of Louisiana presents a distinct economic profile within the United States. Its economic output, when evaluated on a per capita basis, places it in the lower-middle tier of the nation. As of 2024, Louisiana's GDP per capita reached \$71,292, ranking it 38th nationally. This position underscores the critical importance of implementing pro-growth policies to enhance its economic standing and competitiveness (see graphic IX-1).

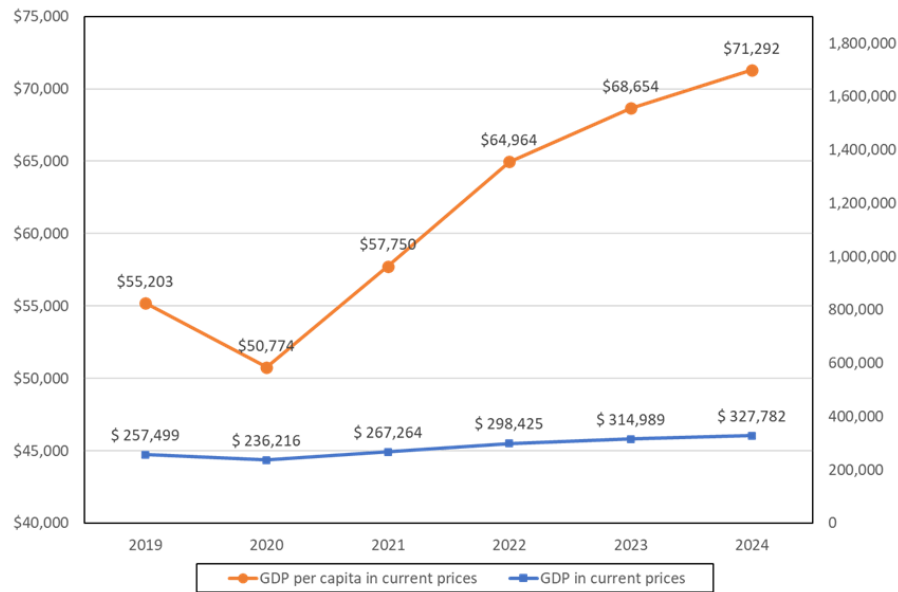
Graphic IX-1. United States: States Ranking by GDP per Capita (2024)



Sources: US Bureau of Economic Analysis; Telecom Advisory Services analysis

Despite its ranking, the state's recent growth trajectory displays an upward momentum. Between 2019 and 2024, Louisiana's economy exhibited a remarkable expansion, with its total GDP growing from approximately \$257 billion to over \$327 billion. This surge was mirrored in its per capita figures, which experienced an impressive increase of 29.14% over the same period, demonstrating a significant underlying potential for accelerated progress through strategic policy interventions (see graphic IX-2).

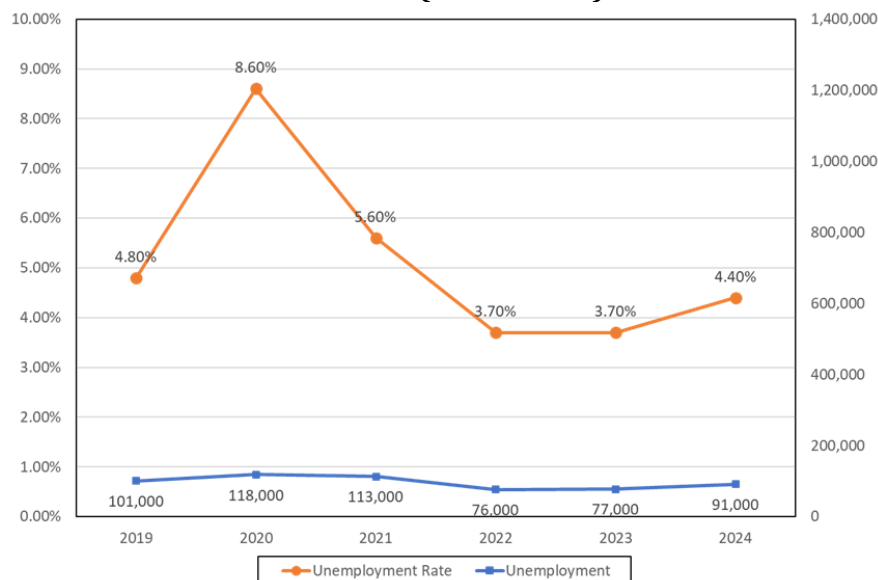
Graphic IX-2. Louisiana: Gross Domestic Product and GDP Per Capita (2019-2024)



Sources: US Bureau of Economic Analysis; Telecom Advisory Services analysis

An analysis of the state's labor market, however, reveals a more volatile picture. After a dramatic spike to 8.60% in 2020, the unemployment rate improved significantly but has recently trended upward, settling at 4.40% in 2024. This figure, which is elevated compared to many other states, highlights the persistent need for policies that not only foster GDP growth but also directly stimulate job creation (see graphic IX-3).

Graphic IX-3. Louisiana: Unemployment Rate and Number of Unemployed Workers (2019-2024)



Sources: US Bureau of Labor Statistics; Telecom Advisory Services analysis

In this context of strong growth potential tempered by a challenging labor market, the analysis of fiscal policies that encourage investment in critical infrastructure becomes particularly pertinent.

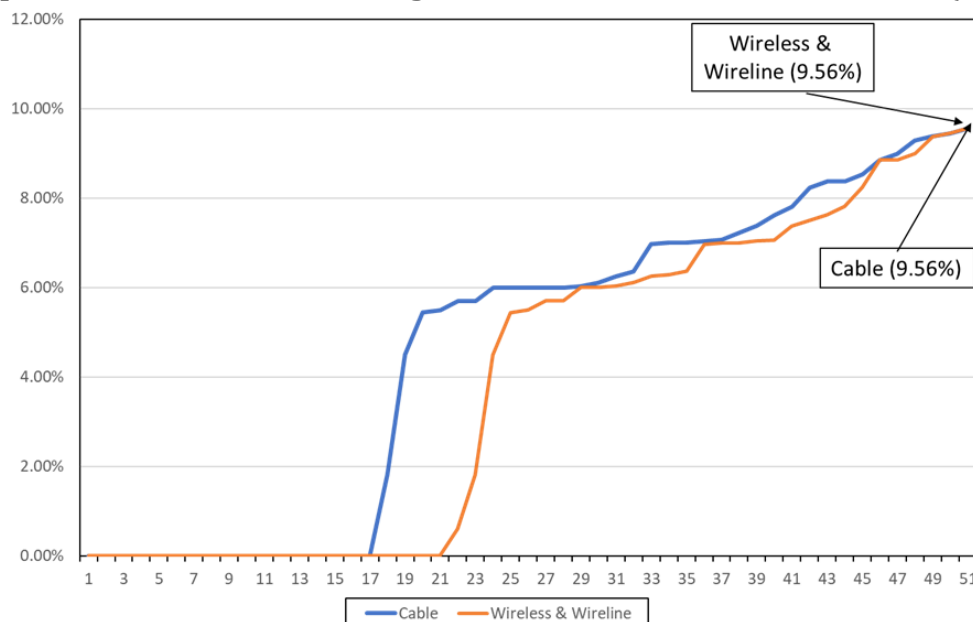
Louisiana currently ranks 41st among states in terms of internet coverage, speed and availability, meaning that approximately 18% of residents are not able to purchase an internet plan of at least 5 Mbps download and 3 Mbps upload (36.4% are unable to purchase an FTTH plan).⁴⁶

The Broadband for Everyone in Louisiana (BEL) commission stipulates in its mission to “Improve both the adoption and availability of broadband service for Louisiana residents by providing universal access to broadband service with minimum committed speed of 25 Megabits per second (Mbps) download and 3 Mbps upload, scalable to up to 100 Mbps download and 100 Mbps upload, for all Louisianans by 2029.”⁴⁷ In this context, the evaluation of taxation regimes on the purchasing of communications equipment is crucial for determining how to further enhance economic growth and job creation within the state.

IX.2. Current taxation regime on initial equipment purchasing by telecommunications and cable service providers in Louisiana

Louisiana's fiscal policy on communications equipment is an outlier nationally, imposing the most significant tax burden of any state. In 2024, both cable operators and telecommunications service providers were subject to a combined state and local sales tax rate of 9.56%. This exceptionally high-rate places Louisiana last in the nation, ranking 51st for its tax on network investment. This uncompetitive tax environment represents a substantial barrier to capital deployment (see Graphic IX-4).

Graphic IX-4. Louisiana: Ranking in US Sales Tax Rate on Investment (2024)



Sources: Tax Foundation; Telecom Advisory Services analysis

⁴⁶ Broadband Now. *Louisiana Internet coverage and availability in 2025*. Retrieved in: <https://broadbandnow.com/Louisiana>

⁴⁷ Office of the Governor. *Broadband for Everyone in Louisiana*. Retrieved in: <https://gov.louisiana.gov/page/Broadband-for-Louisiana>

The relationship between this tax policy and capital investment within the state warrants close examination. An analysis of the period between 2019 and 2024 reveals a highly volatile investment climate operating under the nation's highest tax burden. While the tax rate steadily increased from 9.45% to 9.56%, per capita investment fluctuated dramatically, peaking at \$196 in 2022 before plummeting to \$141 in 2023 and recovering only slightly to \$151 in 2024. Although investment decisions are influenced by numerous market factors, such an exceptionally high and rising tax burden acts as a powerful disincentive. By significantly increasing the cost of every new deployment, this tax regime creates an unpredictable environment and inherently constrains the potential for more stable and sustained capital investment over the long term.

In light of the role that the sales tax on communications equipment may have in constraining investment, we now proceed to quantify the potential economic impact that would result from its elimination within the state.

IX.3. Economic impact of taxation of communications network equipment taxation in Louisiana

Building upon the national econometric models detailed in Chapter III and V, this section quantifies the potential economic impact of repealing the sales tax on communications network equipment in Louisiana. The analysis estimates both the immediate, short-term effects on investment and the subsequent contributions to the state's economic output and job market. The primary estimation is derived from the model's coefficient, which indicates that a one percentage point decrease in the sales tax rate stimulates a 2.1% increase in capital investment. As Louisiana currently levies the nation's highest tax at 9.56%, a complete elimination is projected to generate a substantial surge in network deployment spending. The following table outlines the expected increase in investment under two scenarios: a full elimination of the tax and a 50% reduction (see Table IX-1).

Table IX-1. Louisiana: Estimation of the Increase in Communications Investment Resulting from Changes in the Sales Tax on Network Equipment
(in \$ millions unless indicated)

	Year 1	Two-Year Total
Full Elimination of Sales Tax		
Investment Growth	\$ 95	\$ 190
Savings from Sales Tax Elimination	\$ 45	\$ 90
Share of Savings Reinvested	211%	211%
50% Reduction of Sales Tax		
Investment Growth	\$ 48	\$ 95
Savings from Sales Tax Elimination	\$ 23	\$ 45
Share of Savings Reinvested	211%	211%

Source: Telecom Advisory Services analysis

The estimates presented in Table IX-1 highlight a critical finding: the powerful incentive effect of tax reduction. The capital deployed by operators is projected to be 211% of the amount saved from the tax itself. This demonstrates that tax relief not only increases the supply of funds but also dramatically enhances the financial attractiveness of deploying capital in Louisiana, attracting additional investment

that more than doubles the value of the tax savings. This incremental investment, in turn, generates a cascade of positive effects throughout the state's economy. The table below summarizes the estimated statewide socioeconomic impact resulting from the first year of increased investment following a full tax repeal (see Table IX-2).

Table IX-2. Louisiana: Estimation of Socio-Economic Impact of Eliminating Sales Tax on Communications Equipment Purchases

Economic Indicators	Current Level	Estimated Impact 1 Year
GDP Per Capita	\$ 71,292	\$ 71,317
GDP Per Capita Growth	-	0.03%
Incremental Economic Output (\$ million)	-	\$ 223
Incremental GDP (\$ million)	-	\$ 114
Unemployment Rate	4.40%	4.37%
Jobs Year created	-	684
Broadband Connections >10 Mbps	1,587,000	-
Broadband Penetration >10 Mbps	89.01%	-
Broadband Connections >25 Mbps	1,517,000	-
Broadband Penetration >25 Mbps	85.08%	-
Broadband Connections >100 Mbps	882,000	-
Broadband Penetration >100 Mbps	49.47%	-

Source: Telecom Advisory Services analysis

The economic analysis provides compelling evidence that eliminating the sales tax on communications infrastructure is a strategic investment in Louisiana's future. In the first year alone, this policy is projected to generate \$114 million in new Gross Domestic Product and \$223 million in total economic output. This surge would support the creation of 684 jobs-year, contributing to a tangible reduction in the state's unemployment rate. Over two years, the sustained impact would create over \$225 million in new GDP and approximately 1,350 jobs-year.

Crucially, the nature of Louisiana's digital landscape points to a vital use for this new capital. The state faces a significant connectivity gap, with a penetration rate for high-speed service of 100 Mbps at a mere 49.47%—among the lowest in the nation. Therefore, the incremental investment from this tax elimination would be strategically channeled toward fundamental network expansion into unserved and underserved communities. This capital is essential for addressing the digital divide and promoting digital equity.

This focus on closing the connectivity gap is a fundamental necessity for unlocking the economic potential of all regions, ensuring that rural and less-connected areas can participate fully in the modern economy. The productivity benefits are broadly distributed, creating a virtuous cycle of growth that benefits the entire state. Consequently, the initial reduction in tax collections should be viewed as an upfront investment that is quickly offset by new revenues from the resulting widespread economic expansion.

In conclusion, eliminating the nation's highest sales tax on communications equipment is a powerful, pro-growth policy lever. It provides an unparalleled opportunity to generate a significant return on investment, create high-quality jobs,

and bridge the digital divide. By fostering a competitive investment climate, Louisiana can accelerate the deployment of next-generation networks, solidifying its position in the digital economy.

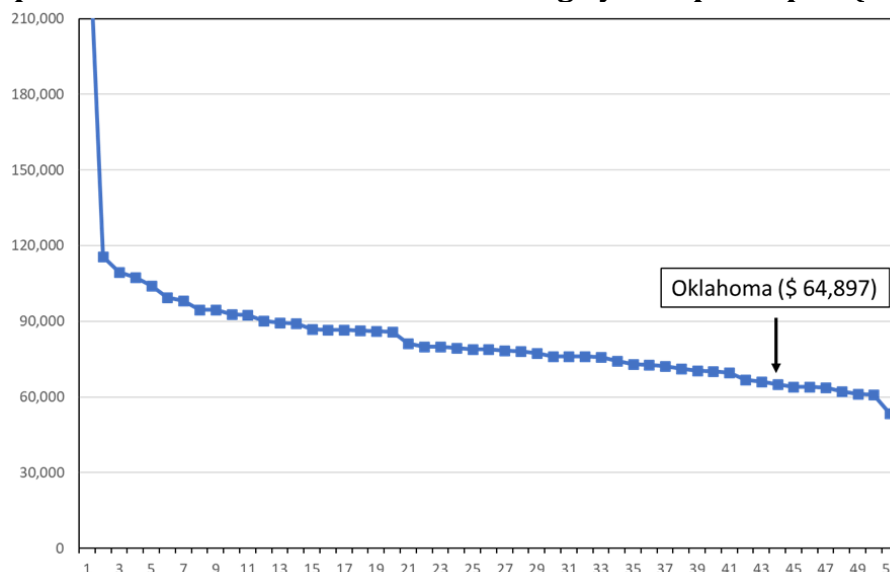
X. THE ECONOMIC CONTRIBUTION OF COMMUNICATIONS NETWORK INVESTMENT IN OKLAHOMA

Following the detailed examination of Louisiana, we now turn our focus to the state of Oklahoma to provide a comparative analysis of the economic implications of its communications equipment sales tax. This chapter applies the same national framework to quantify the specific effects that a similar fiscal reform would have on Oklahoma's distinct economic landscape, offering further evidence of the policy's potential impact. The objective is to evaluate how a strategic adjustment in fiscal policy can serve as a catalyst for investment in critical infrastructure, thereby driving economic growth, job creation, and the enhancement of digital services for its citizens.

X.1. The economy of Oklahoma

The state of Oklahoma stands as a significant and robust component of the United States economy. However, its economic output, when evaluated on a per capita basis, positions it in the lower half of the nation. As of 2024, Oklahoma's GDP per capita reached \$64,897, placing it 44th nationally (see Graphic X-1). This ranking, while providing a valuable static snapshot, must be contextualized within the state's recent and dynamic growth trajectory to be fully understood.

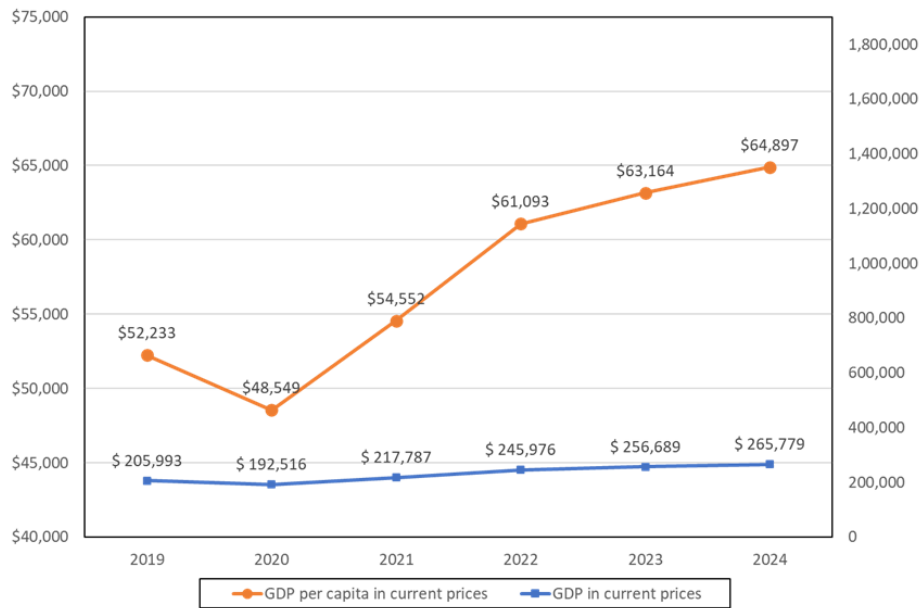
Graphic X-1. United States: States Ranking by GDP per Capita (2024)



Sources: US Bureau of Economic Analysis; Telecom Advisory Services analysis

While the current per capita ranking may appear modest, the narrative of Oklahoma's recent economic momentum is far more compelling and reveals remarkable vitality. Between 2019 and 2024, the state's economy exhibited a notable expansion, with its total GDP growing from approximately \$206 billion to over \$266 billion. This surge was mirrored in its per capita figures, which experienced an impressive increase of 24.25% over the same period. This vigorous and sustained growth underscores an economy that is not only recovering from macroeconomic challenges but is actively building a more solid foundation for future prosperity (see graphic X-2).

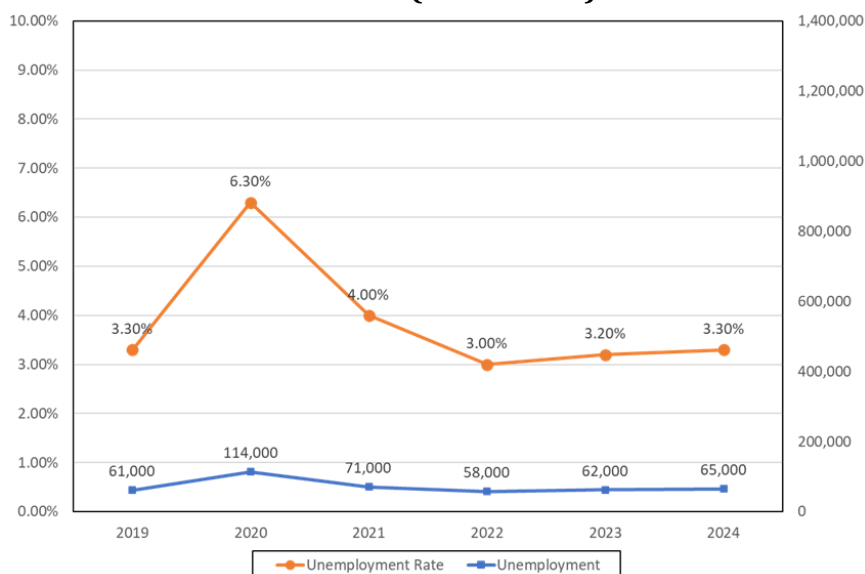
Graphic X-2. Oklahoma: Gross Domestic Product and GDP Per Capita (2019-2024)



Sources: US Bureau of Economic Analysis; Telecom Advisory Services analysis

Complementing this narrative of strong output growth is an analysis of the state's resilient labor market, which has adeptly navigated recent macroeconomic challenges. After registering a low unemployment rate of 3.30% in 2019, the state saw a significant increase to 6.30% in 2020 amid the pandemic-induced economic disruption. However, the labor market demonstrated a strong capacity for a V-shaped recovery, with the rate rapidly descending in subsequent years to stabilize at a healthy 3.30% by 2024, showcasing the underlying strength of the state's employment base and its ability to rebound from shocks (see graphic X-3).

Graphic X-3. Oklahoma: Unemployment Rate and Number of Unemployed Workers (2019-2024)



Sources: US Bureau of Labor Statistics; Telecom Advisory Services analysis

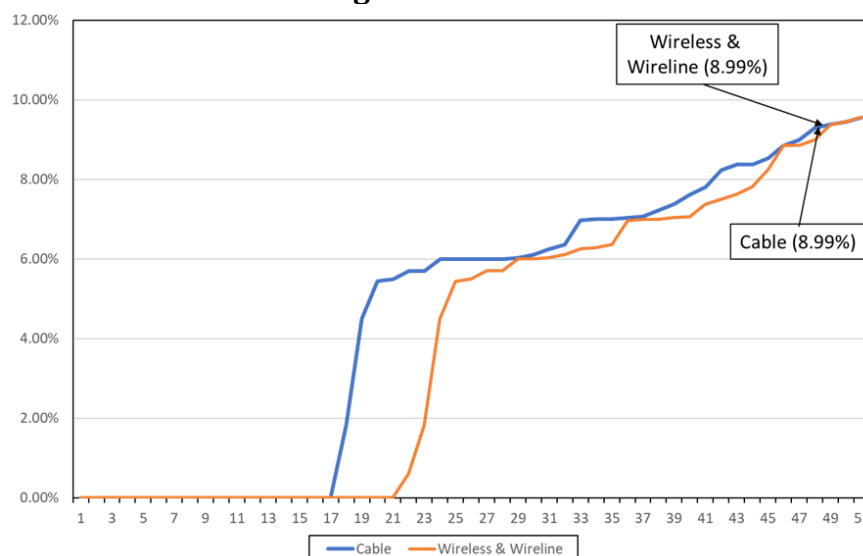
In this context of sustained growth and a stabilized labor market, the analysis of fiscal policies that encourage investment in critical infrastructure becomes particularly pertinent. The evaluation of taxation regimes on communications equipment is crucial for determining how to further enhance economic growth and job creation within the state.

According to the U.S. Census Bureau's 2022, 88.6% of Oklahoma households have a broadband internet subscription, a figure slightly below the national rate of 91.0%. This digital landscape is the focus of the state's broadband strategy; the Oklahoma Broadband Office has developed a Five-Year Action Plan⁴⁸ which aims to ensure all Oklahomans have access to affordable and reliable high-speed internet. It is, therefore, pertinent to examine whether the current tax framework on initial broadband equipment acquisition is consistent with this overarching goal of achieving universal connectivity with high-speed (more than 100 Mbps of download speed) as outlined in the state's strategic plan.

X.2. Current taxation regime on initial equipment purchasing by telecommunications and cable service providers in Oklahoma

Oklahoma is one of 30 states that applies a sales tax to the purchase of telecommunications network equipment and one of 34 states that collects a tax on cable network equipment. In 2024, both cable operators and telecommunications service providers were subject to a combined state and local sales tax rate of 8.99%. This high tax rate positions Oklahoma's tax environment as particularly burdensome relative to the rest of the nation, creating a significant barrier to infrastructure investment. In fact, when ranked among all states, Oklahoma places near the very bottom for its tax rate on network investment, indicating a heavier tax burden than almost all other states and a competitive disadvantage in attracting capital (see Graphic X-4).

Graphic X-4. Oklahoma: Ranking in US Sales Tax Rate on Investment (2024)



Sources: Tax Foundation; Telecom Advisory Services analysis

⁴⁸ Retrieved from: https://oklahoma.gov/content/dam/ok/en/broadband/documents/grant-programs/bead/BEAD_Five-Year_Action_Plan.pdf

The relationship between this tax policy and capital investment within the state warrants close examination. An analysis of the period between 2019 and 2024 reveals a dynamic investment climate operating under a consistently high tax burden. While the sales tax rate saw a modest but steady increase from 8.92% in 2019 to 8.99% by 2024, per capita investment exhibited significant volatility. Investment levels, which began at \$123.38 per capita in 2019, peaked at an exceptional \$179.44 in 2022 before declining sharply to \$121.95 by 2024. Although investment decisions are influenced by numerous market factors, a sustained and elevated tax burden—one of the highest in the nation—acts as a persistent headwind. By increasing the cost of every new deployment, such a tax regime inherently constrains the potential for greater and more sustained capital investment over the long term.

In light of the role that the sales tax on communications equipment may have in constraining investment, we now proceed to quantify the potential economic impact that would result from its elimination within the state.

**X.3. Economic impact of taxation of communications network equipment
taxation in Oklahoma**

Building upon the national econometric models detailed in Chapter III and V, this section quantifies the potential economic impact of repealing the sales tax on communications network equipment in Oklahoma. The analysis estimates both the immediate, short-term effects on investment and the subsequent contributions to the state's economic output, job market, and broadband service quality. The primary estimation is derived from the model's coefficient, which indicates that a one percentage point decrease in the sales tax rate stimulates a 2.1% increase in capital investment. As Oklahoma currently levies a significant 8.99% tax, a complete elimination is projected to generate a substantial surge in network deployment spending. The following table outlines the expected increase in investment under two scenarios: a full elimination of the tax and a 50% reduction. The long-term impact assumes the policy and its stimulus effect are maintained for a second year (see Table X-1).

Table X-1. Oklahoma: Estimation of the Increase in Communications Investment Resulting from Changes in the Sales Tax on Network Equipment
(in \$ millions unless indicated)

	Year 1	Two-Year Total
Full Elimination of Sales Tax		
Investment Growth	\$ 65	\$ 130
Savings from Sales Tax Elimination	\$ 31	\$ 62
Share of Savings Reinvested	211%	211%
50% Reduction of Sales Tax		
Investment Growth	\$ 33	\$ 65
Savings from Sales Tax Elimination	\$ 15	\$ 31
Share of Savings Reinvested	211%	211%

Source: Telecom Advisory Services analysis

The estimates presented in Table X-1 highlight a critical finding of this study: the powerful incentive effect of tax reduction. As indicated by the "Share of Savings Reinvested," the capital deployed by operators is projected to be 211% of the amount saved from the tax itself. This demonstrates that tax relief not only increases the supply of funds available for investment but also enhances the financial attractiveness of deploying capital in Oklahoma relative to other locations, thereby attracting additional investment that more than doubles the value of the tax savings.

This incremental investment, in turn, generates a cascade of positive effects throughout the state's economy. These impacts are categorized into two main areas: the short-term effects from network construction and the direct benefits to consumers through improved broadband quality. The table below summarizes the estimated statewide socioeconomic impact resulting from the first year of increased investment following a full tax repeal (see Table X-2).

Table X-2. Oklahoma: Estimation of Socio-Economic Impact of Eliminating Sales Tax on Communications Equipment Purchases

Economic Indicators	Current Level	Estimated Impact Year 1
GDP Per Capita	\$ 64,897	\$ 64,916
GDP Per Capita Growth	-	0.03%
Incremental Economic Output (\$ million)	-	\$ 152
Incremental GDP (\$ million)	-	\$ 78
Unemployment Rate	3.30%	3.28%
Jobs Year created	-	467
Broadband Connections >10 Mbps	1,290,000	-
Broadband Penetration >10 Mbps	83.60%	-
Broadband Connections >25 Mbps	1,212,000	-
Broadband Penetration >25 Mbps	78.55%	-
Broadband Connections >100 Mbps	831,000	-
Broadband Penetration >100 Mbps	53.86%	-

Source: Telecom Advisory Services analysis

The economic analysis presented herein provides compelling evidence that the elimination of the sales and use tax on communications infrastructure is a strategic investment in Oklahoma's future. In the first year alone, this policy is projected to generate \$78 million in new Gross Domestic Product and \$152 million in total economic output. This surge in economic activity would support the creation of 467 jobs, contributing to a tangible reduction in the state's unemployment rate from 3.30% to 3.28% and strengthening the workforce.

Crucially, the nature of Oklahoma's digital landscape points to a vital use for this new capital. The state faces a significant connectivity gap, with a penetration rate for high-speed service of 100 Mbps at a mere 53.86%—among the lowest in the nation. Therefore, the incremental investment from this tax exemption would be strategically channeled toward fundamental network expansion into unserved and underserved communities. This capital is essential for addressing the digital divide and promoting digital equity.

This focus on closing the connectivity gap is a fundamental necessity for unlocking the economic potential of all regions, ensuring that rural and less-connected areas

can participate fully in the modern economy. The productivity benefits are broadly distributed, creating a virtuous cycle of growth that benefits the entire state. Consequently, the initial reduction in tax collections should be viewed as an upfront investment that is quickly offset by new revenues from the resulting widespread economic expansion.

Furthermore, the future evolution of this investment should be considered. Once the fundamental connectivity gap in unserved and underserved communities is closed, it is foreseeable that the focus of the additional capital will pivot towards enhancing network quality and speed for the entire user base. This second phase would be directly in line with Oklahoma's Five-Year Action Plan, which aspires to provide widespread access to connections of more than 100 Mbps by 2028. In this way, the tax elimination not only addresses the immediate challenge of digital equity but also lays the groundwork for a robust, future-ready communications infrastructure across the state.

In conclusion, eliminating the sales tax on communications equipment is a powerful, pro-growth policy lever. It provides a rare opportunity to generate a significant and immediate return on investment, create high-quality jobs, and deliver direct, tangible benefits to consumers and businesses across the state. By fostering a more competitive investment climate, Oklahoma can accelerate the deployment of next-generation networks, solidifying its position as a leader in the digital economy for decades to come.

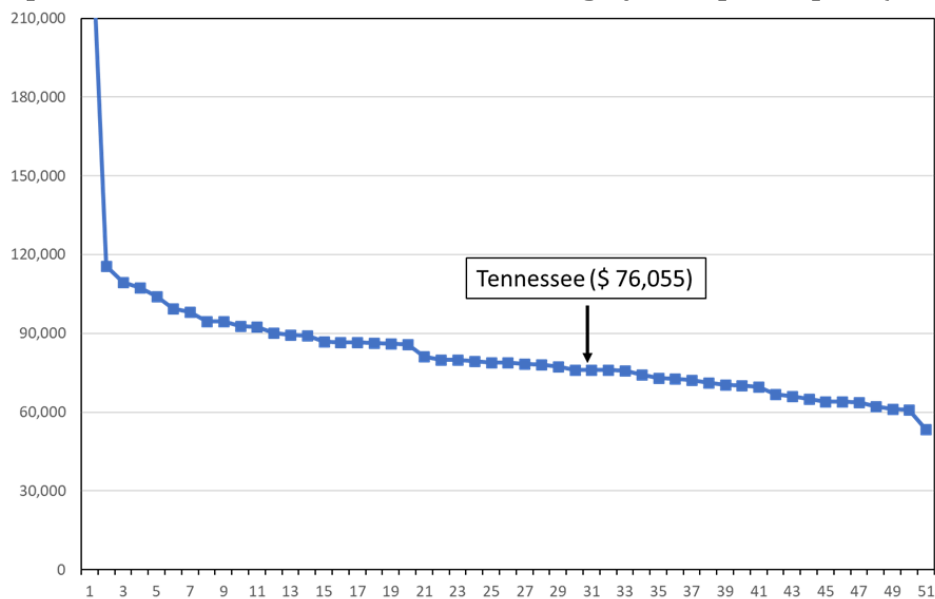
XI. THE ECONOMIC CONTRIBUTION OF COMMUNICATIONS NETWORK INVESTMENT IN TENNESSEE

This chapter presents a unique analysis, shifting from forecasting potential impacts as was the case in prior cases to evaluating the actual results of a recently implemented tax reform. Tennessee provides a compelling case study, having significantly reduced and ultimately eliminated its sales tax on communications equipment in recent years. This chapter will therefore analyze the observed effects of this policy change on network investment within the state. The objective is to evaluate how this strategic adjustment in fiscal policy has served as a catalyst for investment in critical infrastructure, thereby driving economic growth, job creation, and the enhancement of digital services for its citizens.

XI.1. The economy of Tennessee

Tennessee represents a significant and robust component of the United States economy. As of 2024, its GDP per capita reached \$76,055, placing the state 31st nationally (see Graphic XI-1). While this ranking positions Tennessee's economic output near the median, it is the state's recent and dynamic growth trajectory that provides a fuller picture of its economic vitality.

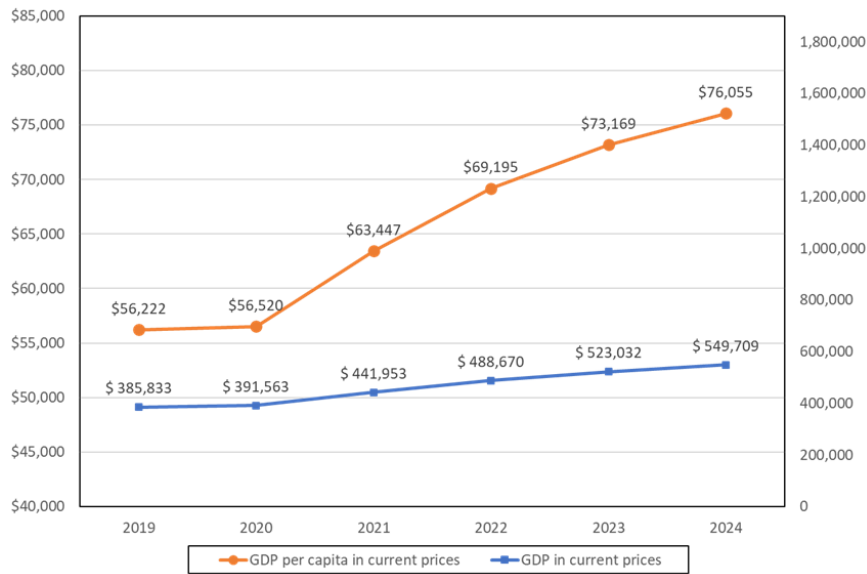
Graphic XI-1. United States: States Ranking by GDP per Capita (2024)



Sources: US Bureau of Economic Analysis; Telecom Advisory Services analysis

While the state's current per capita ranking is near the median, the narrative of Tennessee's recent economic momentum is far more compelling and reveals remarkable vitality. Between 2019 and 2024, the state's economy exhibited a notable expansion, with its total GDP growing from approximately \$386 billion to nearly \$550 billion. This surge was mirrored in its per capita figures, which experienced an impressive increase of over 35% during the same period. This vigorous and sustained growth underscores an economy that is not only recovering from macroeconomic challenges but is actively building a more solid foundation for future prosperity (see Graphic XI-2).

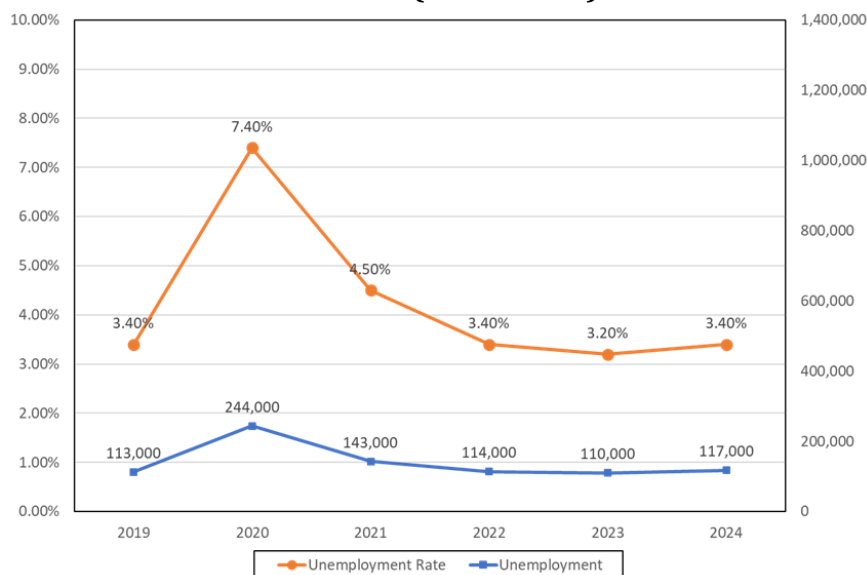
Graphic XI-2. Tennessee: Gross Domestic Product and GDP Per Capita (2019-2024)



Sources: US Bureau of Economic Analysis; Telecom Advisory Services analysis

Complementing this narrative of strong output growth is an analysis of the state's resilient labor market, which has adeptly navigated recent macroeconomic challenges. After registering a low unemployment rate of 3.40% in 2019, the state saw a significant increase to 7.40% in 2020 amid the pandemic-induced economic disruption. However, the labor market demonstrated a strong capacity for a V-shaped recovery, with the rate rapidly descending in subsequent years to stabilize at a healthy 3.40% by 2024, showcasing the underlying strength of the state's employment base and its ability to rebound from shocks (see Graphic XI-3).

Graphic XI-3. Tennessee: Unemployment Rate and Number of Unemployed Workers (2019-2024)



Sources: US Bureau of Labor Statistics; Telecom Advisory Services analysis

Given this context of sustained growth and a stabilized labor market, Tennessee's recent tax policy changes offer a compelling real-world test case. The state's decision

to eliminate the sales tax on communications equipment makes the evaluation of this policy's actual impact crucial for understanding its role in stimulating investment, enhancing economic growth, and creating jobs.

According to the U.S. Census Bureau's 2022 data, 89.6% of Tennessee households have a broadband internet subscription, a figure slightly below the national rate of 91.0%. This digital landscape is the focus of the state's broadband strategy, which is administered by the Tennessee Department of Economic and Community Development (TNECD). The department has developed the Tennessee BEAD 5-Year Action Plan⁴⁹, which aims to ensure all Tennesseans have access to affordable and reliable high-speed internet. Therefore, it is pertinent to examine how the state's recent tax reform on broadband equipment acquisition has supported this overarching goal of achieving universal connectivity, especially for unserved (those lacking 25/3 Mbps speeds) and underserved (those lacking 100/20 Mbps) communities, as prioritized by the state's strategic plan.

XI.2. The Impact of Recent Tax Reform on Communications Investment in Tennessee

In a significant policy shift, Tennessee transitioned from levying a sales tax on communications equipment to completely eliminating it, positioning the state as a highly competitive location for network investment. Previously, providers in Tennessee faced a combined state and local sales tax rate of over 9.50% on network equipment purchases. This framework was fundamentally altered with the passage of the "Tennessee Broadband Investment Maximization Act" in 2022. This legislation was designed to maximize private investment in broadband by repealing the tax for three years, from July 1, 2022 until June 30, 2025. The Legislature subsequently extended the repeal for two additional years, through June 30, 2027. .

This decisive legislative action transformed the state's tax environment from a potential barrier to a powerful incentive for infrastructure deployment.

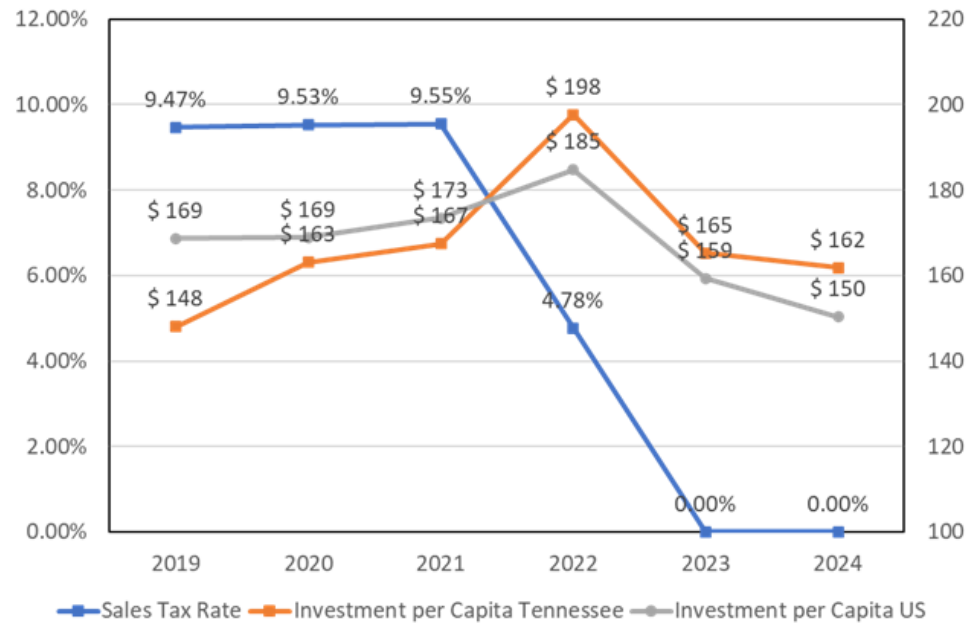
An analysis of the period between 2019 and 2024 reveals a strong correlation between this tax reform and the level of capital investment in the state. The following data illustrates the investment trends before, during, and after the tax elimination: when the tax rate was over 9.5% in 2021, per capita investment stood at \$167.43. In 2022, investment per capita surged by nearly 18% to a five-year peak of \$197.62 even though the sales tax repeal was only in effect for six months in CY2022. This spike strongly suggests that the tax cut prompted an immediate and significant acceleration of capital deployment by service providers.

While investment levels normalized in 2023 and 2024 following the full elimination of the tax, they remained above the pre-reform levels of 2019 and 2020. This trend is even more significant when compared to the national investment cycle. While both Tennessee and the U.S. as a whole saw investment peak in 2022 and decline thereafter, Tennessee's growth surge was nearly three times the national rate

⁴⁹ Retrieved from: <https://www.tn.gov/ecd/rural-development/broadband-office/redirect-provider-resources/bead-program.html>

(18.0% vs. 6.5%). This allowed the state's per capita investment to leapfrog the national average in 2022 (see Graphic XI-4).

Graphic XI-4. Tennessee: Sales Tax Rate and Investment per Capita vs. U.S. Average (2019-2024)



Source: Broadband Tax Institute; Telecom Advisory Services analysis

Furthermore, as the national investment climate cooled in 2023 and 2024, Tennessee maintained its new position above the U.S. average—a complete reversal from the pre-reform years when it consistently lagged behind. The Tennessee case study thus provides powerful evidence that eliminating the sales tax on communications equipment not only spurred a short-term surge but also created a sustained competitive advantage for network investment.

XI.3. Economic Impact of Tax Reform on Communications Investment in Tennessee

Unlike the predictive analysis for other states, Tennessee's case allows for a robust evaluation of the actual socioeconomic impacts driven by its tax reform. To isolate the true effect of the policy from nationwide investment trends, a difference-in-differences analysis is applied. This method compares the change in investment in Tennessee (the "treatment group") against the change in the U.S. national average (the "control group") over the same period.

The result estimates the net investment increase that is directly attributable to the state's tax cut, providing a powerful and precise input for quantifying the downstream economic benefits. (see Table XI-1).

Table XI-1. Tennessee: Difference-in-Differences Analysis of Per Capita Investment (2021-2024)

Indicator	Tennessee (Treatment)	U.S. Average (Control)
Investment Per Capita (Pre-Reform, 2021)	\$167.43	\$173.47
Investment Per Capita (Post-Reform, 2022)	\$197.62	\$184.73
Change (2021-2022)	+\$30.19	+\$11.26
Difference in difference (2021-2022)	+ \$18.93 (+ 11.31%)	
Investment Per Capita (Pre-Reform, 2021)	\$167.43	\$173.47
Investment Per Capita (Post-Reform, 2024)	\$161.82	\$150.38
Change (2021-2024)	-\$5.61	-\$23.09
Difference in difference (2021-2024)	+ \$17.48 (+ 10.44 %)	

Source: Telecom Advisory Services analysis

Crucially, the analysis demonstrates that this positive impact is not merely a short-term phenomenon. By extending the difference-in-differences comparison to 2024, the data reveals the policy's sustained effect. While investment levels cooled nationally after the 2022 peak, Tennessee's investment remained significantly more resilient, declining far less than the U.S. average. The long-term net impact of +\$17.48 per capita (+10.44%) is remarkably close to the initial surge, providing strong evidence that the tax reform established a new, higher, and durable baseline for capital investment in the state. This sustained investment is the key driver of the lasting socioeconomic benefits detailed below.

With current annual investment levels in Tennessee at \$1.17 billion, the sustained net positive impact of 10.44% from the difference-in-differences analysis can be quantified in absolute terms. This methodology implies that of the total capital deployed, an estimated \$110.6 million is directly attributable to the competitive advantage created by the sales tax elimination. This figure, representing the "Total Accelerated Investment," serves as the key input for the following analysis, which quantifies the resulting contributions to Tennessee's GDP, economic output, and job creation.

Table XI-2. Tennessee: Estimated Annual Socio-Economic Impact from Accelerated Investment

Economic Indicators	Estimated Impact
Incremental Economic Output (\$ million)	\$259
Incremental GDP (\$ million)	\$133
Jobs Year created	795

Source: Telecom Advisory Services analysis

The economic analysis provides a powerful validation of Tennessee's policy decision. The accelerated investment of \$110.6 million, directly attributable to the tax reform, is estimated to generate \$133 million in new annual Gross Domestic Product and \$259 million in total economic output. This surge in economic activity supports the creation of 795 high-quality jobs, strengthening the state's workforce. Ultimately, the Tennessee case serves as a compelling empirical case study, demonstrating that eliminating the sales tax on communications equipment is a pro-growth policy with a proven, immediate, and sustained return on investment.

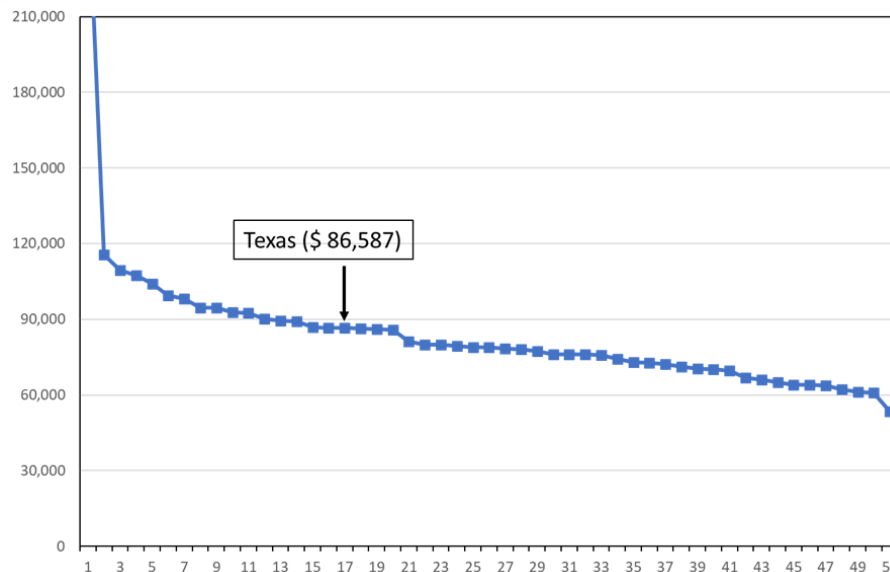
XII. THE ECONOMIC CONTRIBUTION OF COMMUNICATIONS NETWORK INVESTMENT IN TEXAS

Following the analysis of other states, we now turn our focus to Texas to provide a comparative analysis of the economic implications of its communications equipment sales tax. This chapter applies the same national framework to quantify the specific effects that a similar fiscal reform would have on Texas's distinct economic landscape, offering further evidence of the policy's potential impact. The objective is to evaluate how a strategic adjustment in fiscal policy can serve as a catalyst for investment in critical infrastructure, thereby driving economic growth, job creation, and the enhancement of digital services for its citizens.

XII.1. The economy of Texas

The state of Texas stands as a powerhouse of the United States economy, representing one of its largest and most robust components. Its significant economic output, when evaluated on a per capita basis, positions it solidly in the top half of the nation. As of 2024, Texas's GDP per capita reached \$86,587, placing it 17th nationally (see Graphic XII-1). This ranking, while providing a valuable static snapshot, must be contextualized within the state's recent and dynamic growth trajectory to be fully understood.

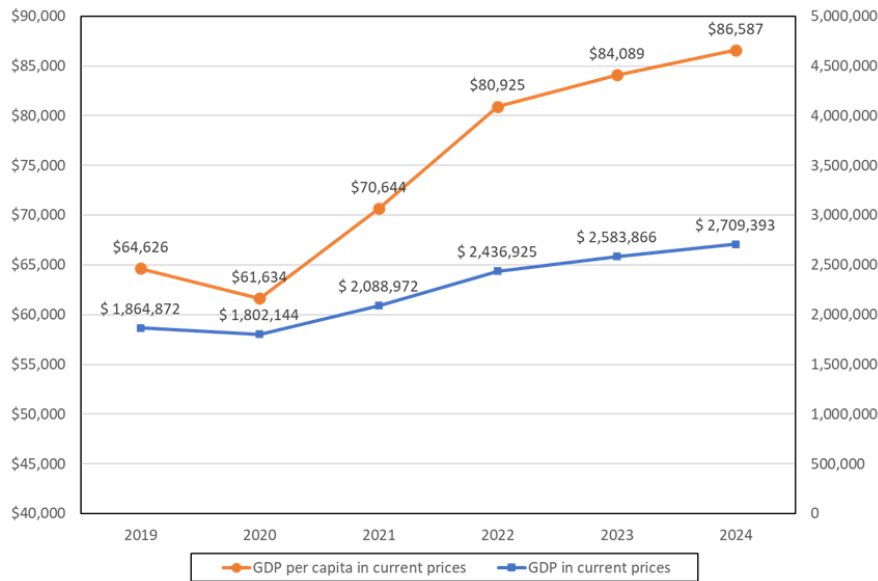
Graphic XII-1. United States: States Ranking by GDP per Capita (2024)



Sources: US Bureau of Economic Analysis; Telecom Advisory Services analysis

While the state's current per capita ranking is strong, the narrative of Texas's recent economic momentum is even more compelling and reveals remarkable vitality. Between 2019 and 2024, the state's economy exhibited a notable expansion, with its total GDP growing from approximately \$1.86 trillion to over \$2.7 trillion. This surge was mirrored in its per capita figures, which experienced an impressive increase of nearly 34% over the same period, rising from \$64,626 to \$86,587. This vigorous and sustained growth underscores an economy that is not only recovering from macroeconomic challenges but is actively building a more solid foundation for future prosperity (see graphic XII-2).

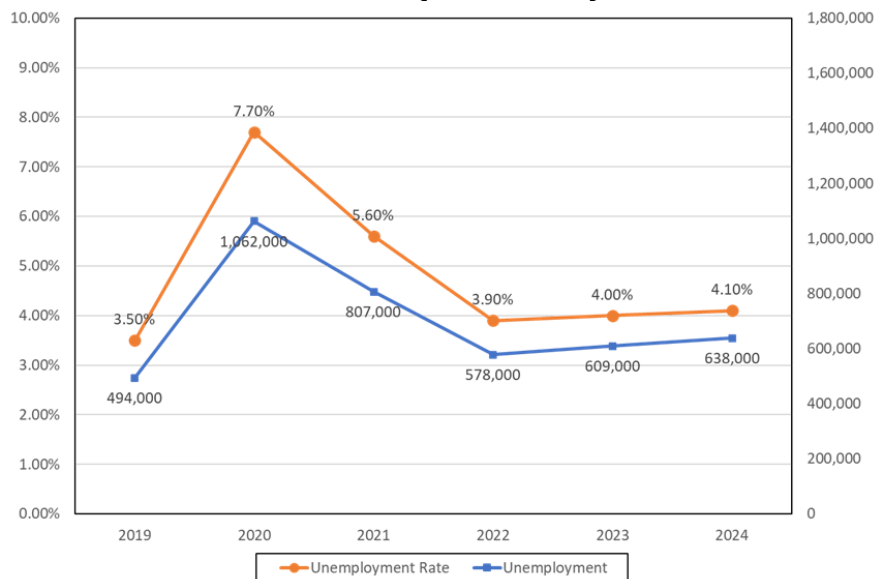
Graphic XII-2. Texas: Gross Domestic Product and GDP Per Capita (2019-2024)



Sources: US Bureau of Economic Analysis; Telecom Advisory Services analysis

Complementing this narrative of strong output growth is an analysis of the state's resilient labor market, which has adeptly navigated recent macroeconomic challenges. After registering a low unemployment rate of 3.50% in 2019, the state saw a significant increase to 7.70% in 2020 amid the pandemic-induced economic disruption. However, the labor market demonstrated a strong capacity for recovery, with the rate rapidly descending in subsequent years to stabilize around 4.10% by 2024, showcasing the underlying strength of the state's employment base and its ability to rebound from shocks (see graphic XII-3).

Graphic XII-3. Texas: Unemployment Rate and Number of Unemployed Workers (2019-2024)



Sources: US Bureau of Labor Statistics; Telecom Advisory Services analysis

In this context of sustained growth and a stabilized labor market, an analysis of fiscal policies that encourage investment in critical infrastructure becomes particularly pertinent. The evaluation of taxation regimes on communications equipment is crucial for determining how to further enhance economic growth and job creation within the state.

According to the U.S. Census Bureau's 2022 data, 91.5% of Texas households have a broadband internet subscription, a figure slightly above the national rate of 91.0%. While this indicates strong connectivity, this digital landscape remains the focus of the state's broadband strategy. The Texas Broadband Development Office, under the Comptroller of Public Accounts, has developed the Texas Broadband Plan⁵⁰ to address the significant number of residents still lacking reliable service. It is, therefore, pertinent to examine whether the current tax framework on initial broadband equipment acquisition is consistent with the overarching goal of achieving universal connectivity, particularly for the more than 2.8 million households the state has identified as lacking reliable internet access and 5.6 million households that do not have quality internet.

XII.2. Current taxation regime on initial equipment purchasing by telecommunications and cable service providers in Texas

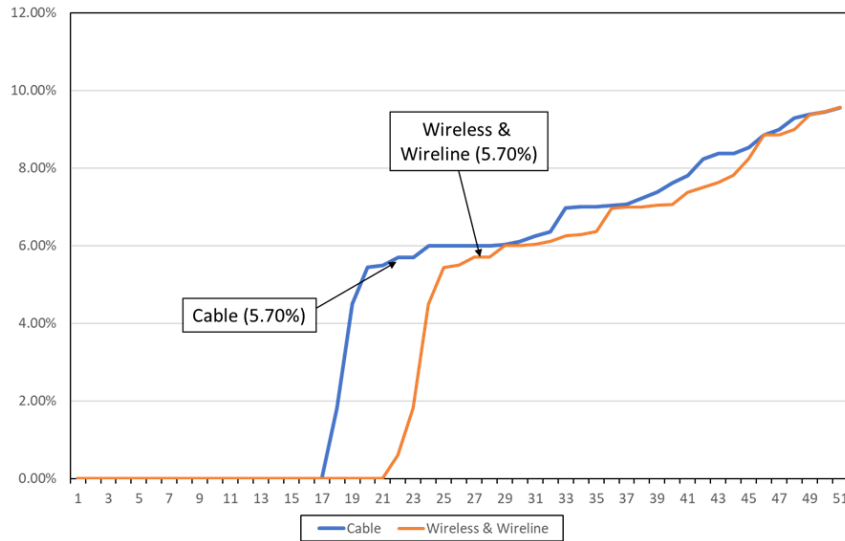
Texas is one of 30 states that applies a sales tax to the purchase of telecommunications network equipment and one of 34 states that collects a tax on cable network equipment. In 2024, both cable operators and telecommunications service providers were subject to a combined state and local sales tax rate of 5.70%.⁵¹ This rate positions Texas's tax environment near the median relative to the rest of the nation. When ranked among all states, Texas's tax rate on network investment places it in the middle of the distribution, indicating a more moderate tax burden compared to states with the highest rates (see Graphic XII-4).

⁵⁰ Retrieved from:

<https://comptroller.texas.gov/programs/broadband/about/what/docs/broadband-plan-22.pdf>

⁵¹ Texas provides a partial refund of state sales taxes paid on network machinery and equipment, capped at \$50 million annually for all companies. The 5.70% rate reflects a pro-rata reduction in the state sales tax of 6.25% plus the average 1.95% local sales tax rate.

Graphic XII-4. Texas: Ranking in US Sales Tax Rate on Investment (2024)



Sources: Tax Foundation; Telecom Advisory Services analysis

The relationship between this tax policy and capital investment within the state warrants close examination. An analysis of the period between 2019 and 2024 reveals a dynamic investment climate operating under a relatively stable tax rate. While the sales tax rate remained consistent at 5.69% for the first three years before a minor increase to 5.70% for 2022-2024, per capita investment exhibited significant volatility. Investment levels, which began at \$193.09 per capita in 2019, peaked at \$213.85 in 2023 before declining to \$198.00 by 2024. Although investment decisions are influenced by numerous market factors, a sustained tax burden can act as a persistent headwind. By increasing the cost of every new deployment, such a tax regime may constrain the potential for greater and more sustained capital investment over the long term.

In light of the role that the sales tax on communications equipment may have in constraining investment, we now proceed to quantify the potential economic impact that would result from its elimination within the state.

XII.3. Economic impact of taxation of communications network equipment taxation in Texas

Building upon the national econometric models detailed in Chapter III and V, this section quantifies the potential economic impact of repealing the sales tax on communications network equipment in Texas. The analysis estimates both the immediate, short-term effects on investment and the subsequent contributions to the state's economic output, job market, and broadband service quality. The primary estimation is derived from the model's coefficient, which indicates that a one percentage point decrease in the sales tax rate stimulates a 2.1% increase in capital investment. As Texas currently levies a 5.70% tax, a complete elimination is projected to generate a substantial surge in network deployment spending. The following table outlines the expected increase in investment under two scenarios: a full elimination of the tax and a 50% reduction. The long-term impact assumes the policy and its stimulus effect are maintained for a second year (see Table XII-1).

Table XII-1. Texas: Estimation of the Increase in Communications Investment Resulting from Changes in the Sales Tax on Network Equipment (*in \$ millions unless indicated*)

	Year 1	Two-Year Total
Full Elimination of Sales Tax		
Investment Growth	\$ 508	\$ 1,015
Savings from Sales Tax Elimination	\$ 241	\$ 482
Share of Savings Reinvested	211%	211%
50% Reduction of Sales Tax		
Investment Growth	\$ 254	\$ 508
Savings from Sales Tax Elimination	\$ 121	\$ 241
Share of Savings Reinvested	211%	211%

Source: Telecom Advisory Services analysis

The estimates presented in Table XII-1 highlight a critical finding of this study: the powerful incentive effect of tax reduction. As indicated by the "Share of Savings Reinvested," the capital deployed by operators is projected to be 211% of the amount saved from the tax itself. This demonstrates that tax relief not only increases the supply of funds available for investment but also enhances the financial attractiveness of deploying capital in Texas relative to other locations, thereby attracting additional investment that more than doubles the value of the tax savings.

This incremental investment, in turn, generates a cascade of positive effects throughout the state's economy. These impacts are categorized into two main areas: the short-term effects from network construction and the direct benefits to consumers through improved broadband quality. The table below summarizes the estimated statewide socio-economic impact resulting from the first year of increased investment following a full tax repeal (see Table XII-2).

Table XII-2. Texas: Estimation of Socio-Economic Impact of Eliminating Sales Tax on Communications Equipment Purchases

Economic Indicators	Current Level	Estimated Impact 1 Year
GDP Per Capita	\$ 86,587	\$ 86,607
GDP Per Capita Growth	-	0.02%
Incremental Economic Output (\$ million)	-	\$ 1,186
Incremental GDP (\$ million)	-	\$ 609
Unemployment Rate	4.10%	4.08%
Jobs Year created	-	3,646
Broadband Connections >10 Mbps	10,301,000	10,336,196
Broadband Penetration >10 Mbps	95.85%	96.18%
Broadband Connections >25 Mbps	10,001,000	10,054,181
Broadband Penetration >25 Mbps	93.06%	93.55%
Broadband Connections >100 Mbps	6,902,000	6,965,752
Broadband Penetration >100 Mbps	64.22%	64.82%

Source: Telecom Advisory Services analysis

The economic analysis presented here provides compelling evidence that eliminating the sales and use tax on communications infrastructure is a strategic investment in Texas's future. In the first year alone, this policy is projected to generate \$609 million in new Gross Domestic Product and \$1,186 million in total economic output. This surge in economic activity would support the creation of

3,646 jobs, contributing to a tangible reduction in the state's unemployment rate from 4.10% to 4.08% and strengthening the workforce.

Crucially, Texas's digital landscape points to a vital use for this new capital. While progress has been made, the state still faces a connectivity gap, with the penetration rate for high-speed service (100 Mbps) at 64.22%, leaving over a third of households without top-tier connections. The incremental investment from this tax elimination would be strategically channeled to address this gap. The analysis projects that this new capital would connect an additional 63,752 households to high-speed internet in the first year alone. This capital is essential for fundamental network expansion into unserved and underserved communities, directly addressing the digital divide and promoting digital equity across Texas.

This focus on closing the connectivity gap is a fundamental necessity for unlocking the economic potential of all regions, ensuring that rural and less-connected areas can participate fully in the modern economy. The productivity benefits are broadly distributed, creating a virtuous cycle of growth that benefits the entire state. Consequently, the initial reduction in tax collections should be viewed as an upfront investment that is quickly offset by new revenues from the resulting widespread economic expansion.

In conclusion, eliminating the sales tax on communications equipment is a powerful, pro-growth policy lever. It provides a rare opportunity to generate a significant and immediate return on investment, create high-quality jobs, and deliver direct benefits to consumers and businesses across the state. By fostering a more competitive investment climate, Texas can accelerate the deployment of next-generation networks, solidifying its position as a leader in the digital economy for decades to come.

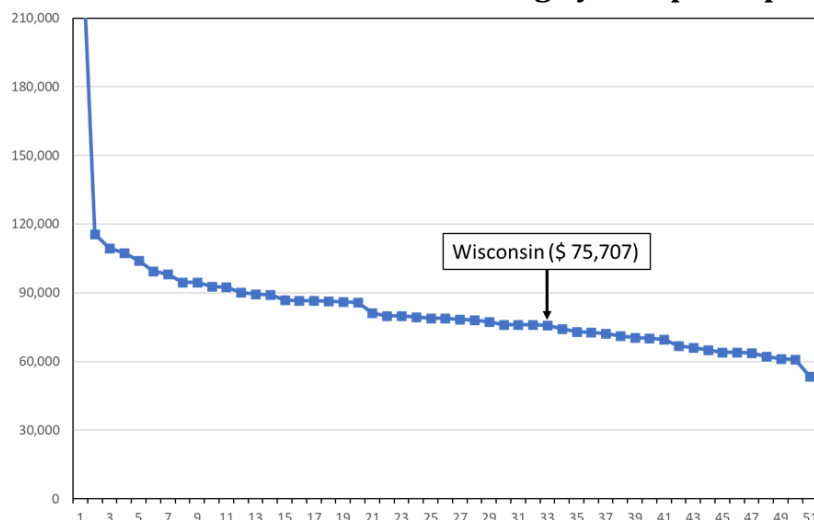
XIII. THE ECONOMIC CONTRIBUTION OF COMMUNICATIONS NETWORK INVESTMENT IN WISCONSIN

Following the analysis of other states, we now turn our focus to Wisconsin to provide a comparative analysis of the economic implications of its communications equipment sales tax. This chapter applies the same national framework to quantify the specific effects that a similar fiscal reform would have on Wisconsin's distinct economic landscape, offering further evidence of the policy's potential impact. The objective is to evaluate how a strategic adjustment in fiscal policy can serve as a catalyst for investment in critical infrastructure, thereby driving economic growth, job creation, and the enhancement of digital services for its citizens.

XIII.1. The economy of Wisconsin

The state of Wisconsin is a significant and robust component of the United States economy. Its economic output, when evaluated on a per capita basis, positions it near the national median. As of 2024, Wisconsin's GDP per capita reached \$75,707, placing it 33rd nationally (see Graphic XIII-1). This ranking, while providing a valuable static snapshot, must be contextualized within the state's recent and dynamic growth trajectory to be fully understood.

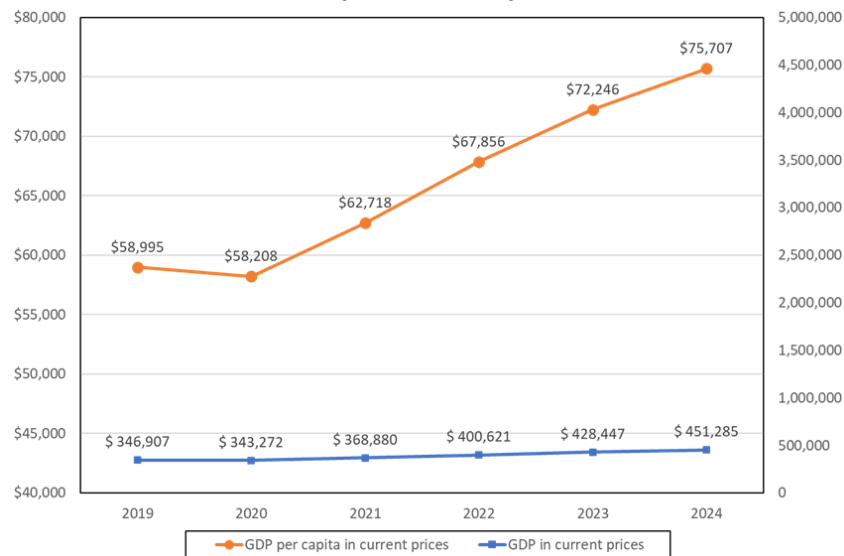
Graphic XIII-1. United States: States Ranking by GDP per Capita (2024)



Sources: US Bureau of Economic Analysis; Telecom Advisory Services analysis

While the state's current per capita ranking is near the median, the narrative of Wisconsin's recent economic momentum is compelling and reveals remarkable vitality. Between 2019 and 2024, the state's economy exhibited a notable expansion, with its total GDP growing from approximately \$347 billion to over \$451 billion. This surge was mirrored in its per capita figures, which experienced an impressive increase of nearly 28.3% over the same period, rising from \$58,995 to \$75,707. This vigorous and sustained growth underscores an economy that is not only recovering from macroeconomic challenges but is actively building a more solid foundation for future prosperity (see graphic XIII-2).

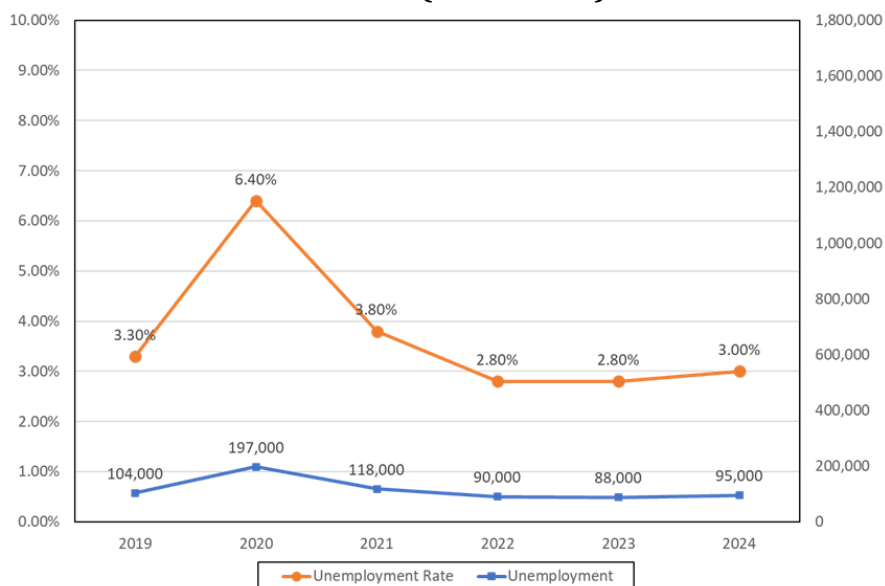
Graphic XIII-2. Wisconsin: Gross Domestic Product and GDP Per Capita (2019-2024)



Sources: US Bureau of Economic Analysis; Telecom Advisory Services analysis

Complementing this narrative of strong output growth is an analysis of the state's resilient labor market, which has adeptly navigated recent macroeconomic challenges. After registering a low unemployment rate of 3.30% in 2019, the state saw an increase to 6.40% in 2020 amid the pandemic-induced economic disruption. However, the labor market demonstrated a strong capacity for recovery, with the rate rapidly descending in subsequent years to an even lower 3.00% by 2024, showcasing the underlying strength of the state's employment base and its ability to rebound from shocks (see graphic XIII-3).

Graphic XIII-3. Wisconsin: Unemployment Rate and Number of Unemployed Workers (2019-2024)



Sources: US Bureau of Labor Statistics; Telecom Advisory Services analysis

In this context of sustained growth and a stabilized labor market, an analysis of fiscal policies that encourage investment in critical infrastructure becomes particularly

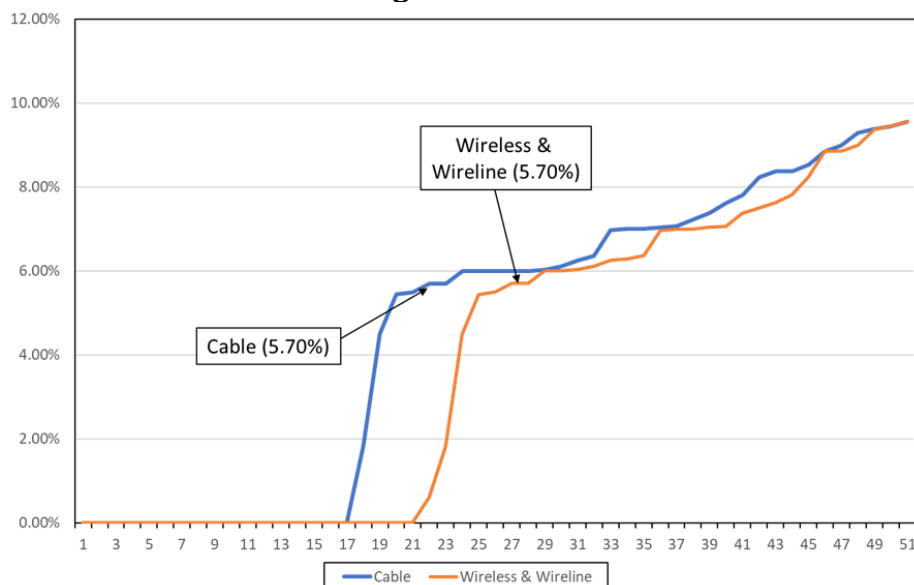
pertinent. The evaluation of taxation regimes on communications equipment is crucial for determining how to further enhance economic growth and job creation within the state.

According to the FCC's data as of June 2024, Wisconsin's connectivity shows room for improvement. While 89.33% of households had access to connections of at least 10 Mbps and 84.34% had access to 25 Mbps, these figures are below the national average. This digital landscape is the focus of the state's comprehensive broadband strategy, spearheaded by the Wisconsin Broadband Office (WBO), which operates within the Public Service Commission of Wisconsin (PSC). The WBO's core mission is to make high-speed internet accessible and affordable for every resident. To achieve this, the office leads a variety of statewide efforts, including managing broadband grant programs to fund infrastructure expansion, compiling detailed service maps to identify underserved areas, and developing the official State Broadband Plan. Furthermore, the WBO is actively engaged in promoting digital equity and inclusion, ensuring all Wisconsinites can share in the benefits of modern technology.

XIII.2. Current taxation regime on initial equipment purchasing by telecommunications and cable service providers in Wisconsin

Wisconsin is one of 30 states that applies a sales tax to the purchase of telecommunications network equipment and one of 34 states that collects a tax on cable network equipment. In 2024, both cable operators and telecommunications service providers were subject to a combined state and local sales tax rate of 5.70%. This rate positions Wisconsin's tax environment near the median relative to the rest of the nation. When ranked among all states, Wisconsin's tax rate on network investment places it in the middle of the distribution, indicating a more moderate tax burden compared to states with the highest rates (see Graphic XIII-4).

Graphic XIII-4. Wisconsin: Ranking in US Sales Tax Rate on Investment (2024)



Sources: Tax Foundation; Telecom Advisory Services analysis

The relationship between this tax policy and capital investment within the state warrants close examination. An analysis of the period between 2019 and 2024 reveals a dynamic investment climate. While the sales tax rate remained relatively stable around 5.43% for most of the period before rising to 5.70% in 2024, per capita investment exhibited significant volatility. Investment levels, which began at \$129.00 per capita in 2019, peaked at \$151.87 in 2022 before declining to \$142.00 by 2024. Although investment decisions are influenced by numerous market factors, a sustained tax burden can act as a persistent headwind. By increasing the cost of every new deployment, such a tax regime may constrain the potential for greater and more sustained capital investment over the long term.

In light of the role that the sales tax on communications equipment may have in constraining investment, we now proceed to quantify the potential economic impact that would result from its elimination within the state.

XIII.3. Economic impact of taxation of communications network equipment taxation in Wisconsin

Building upon the national econometric models detailed in Chapter III and V, this section quantifies the potential economic impact of repealing the sales tax on communications network equipment in Wisconsin. The analysis estimates both the immediate, short-term effects on investment and the subsequent contributions to the state's economic output, job market, and broadband service quality. The primary estimation is derived from the model's coefficient, which indicates that a one percentage point decrease in the sales tax rate stimulates a 2.1% increase in capital investment. As Wisconsin currently levies a 5.70% tax, a complete elimination is projected to generate a substantial surge in network deployment spending. The following table outlines the expected increase in investment under two scenarios: a full elimination of the tax and a 50% reduction. The long-term impact assumes the policy and its stimulus effect are maintained for a second year (see Table XIII-1).

Table XIII-1. Wisconsin: Estimation of the Increase in Communications Investment Resulting from Changes in the Sales Tax on Network Equipment
(in \$ millions unless indicated)

	Year 1	Two-Year Total
Full Elimination of Sales Tax		
Investment Growth	\$ 67	\$ 133
Savings from Sales Tax Elimination	\$ 32	\$ 63
Share of Savings Reinvested	211%	211%
50% Reduction of Sales Tax		
Investment Growth	\$ 33	\$ 67
Savings from Sales Tax Elimination	\$ 16	\$ 32
Share of Savings Reinvested	211%	211%

Source: Telecom Advisory Services analysis

The estimates presented in Table XIII-1 highlight a critical finding of this study: the powerful incentive effect of tax reduction. As indicated by the "Share of Savings Reinvested," the capital deployed by operators is projected to be 211% of the amount saved from the tax itself. This demonstrates that tax relief not only increases the supply of funds available for investment but also enhances the financial

attractiveness of deploying capital in Wisconsin relative to other locations, thereby attracting additional investment that more than doubles the value of the tax savings.

This incremental investment, in turn, generates a cascade of positive effects throughout the state's economy. These impacts are categorized into two main areas: the short-term effects from network construction and the direct benefits to consumers through improved broadband quality. The table below summarizes the estimated statewide socio-economic impact resulting from the first year of increased investment following a full tax repeal (see Table XIII-2).

Table XIII-2. Wisconsin: Estimation of Socio-Economic Impact of Eliminating Sales Tax on Communications Equipment Purchases

Economic Indicators	Current Level	Estimated Impact 1 Year
GDP Per Capita	\$ 75,707	\$ 75,720
GDP Per Capita Growth	-	0.02%
Incremental Economic Output (\$ million)	-	\$ 156
Incremental GDP (\$ million)	-	\$ 80
Unemployment Rate	3.00%	2.98%
Jobs Year created	-	479
Broadband Connections >10 Mbps	2,185,000	-
Broadband Penetration >10 Mbps	89.33%	-
Broadband Connections >25 Mbps	2,063,000	-
Broadband Penetration >25 Mbps	84.34%	-
Broadband Connections >100 Mbps	887,000	-
Broadband Penetration >100 Mbps	36.26%	-

Source: Telecom Advisory Services analysis

The economic analysis presented here provides compelling evidence that eliminating the sales and use tax on communications infrastructure is a strategic investment in Wisconsin's future. In the first year alone, this policy is projected to generate \$80 million in new Gross Domestic Product and \$156 million in total economic output. This surge in economic activity would support the creation of 479 jobs, contributing to a tangible reduction in the state's unemployment rate from 3.00% to 2.98% and strengthening the workforce.

Crucially, Wisconsin's digital landscape points to a vital use for this new capital. The state faces a significant connectivity gap, with the penetration rate for high-speed service (100 Mbps) at just 36.26%, leaving a majority of households without top-tier connections. Therefore, the incremental investment from this tax elimination would be strategically channeled to address this critical gap. While the precise number of new connections isn't quantified, this new capital is essential for a significant expansion of the network into unserved and underserved communities, directly addressing the digital divide and promoting digital equity across Wisconsin.

This focus on closing the connectivity gap is fundamental to unlocking the economic potential of all regions, ensuring that rural and less-connected areas can participate fully in the modern economy. The productivity benefits are broadly distributed, creating a virtuous cycle of growth that benefits the entire state. Consequently, the initial reduction in tax collections should be viewed as an upfront investment that is quickly offset by new revenues from the resulting widespread economic expansion.

In conclusion, eliminating the sales tax on communications equipment is a powerful, pro-growth policy lever. It provides a rare opportunity to generate a significant and immediate return on investment, create high-quality jobs, and deliver direct benefits to consumers and businesses across the state. By fostering a more competitive investment climate, Wisconsin can accelerate the deployment of next-generation networks, solidifying its position in the digital economy for decades to come.

BIBLIOGRAPHY

- Andrianaivo, M., and Kpodar, K. R. (2011). *ICT, financial inclusion, and growth: Evidence from African countries*. IMF Working Papers, 2011(073).
- Arawomo, O., & Apanisile, J. F. (2018). Determinants of foreign direct investment in the Nigerian telecommunication sector. *Modern Economy*, 9(05), 907.
- Arvin, M. and Pradhan, R. (2014) "Broadband penetration and economic growth nexus: evidence from cross-country panel data". *Journal of Applied Economics*, Volume 46 - Issue 35
- Atkinson, R., Castro, D. & Ezell, S.J. (2009). *The digital road to recovery: a stimulus plan to create jobs, boost productivity and revitalize America*. The Information Technology and Innovation Foundation, Washington, DC.
- Auerbach, A. (2005). *Taxation and capital spending*. Paper prepared for the Academic Consultants Meeting of the Board of Governors of the Federal Reserve System. University of California and NBER.
- Beatty, R., Riffe, S., and Welch, I. (1997). "How Firms make capital expenditures decisions: financial signals, internal cash flows, income taxes and the Tax Reform Act of 1986". *Review of Quantitative Finance and Accounting*, 9: 227-250.
- Bierbaum, D., Fenwick, J. and Mackey, S. (2011). *Property Tax Discrimination: Barrier to broadband*. Presentation at the ALEC Spring Conference. Cincinnati, OH, April 29, 2011.
- Billington, N. (1999) "The location of foreign direct investment: an empirical analysis", *Applied Economics*, 31, 65-76.
- Black, E; Legoria, J. and Sellers, K. (2000). "Capital Investment Effects of Dividend Imputation," *Journal of the American Taxation Association* 22(2), 40-59.
- Briglauer, W., & Gugler, K. (2019). "Go for gigabit? First evidence on economic benefits of high-speed broadband technologies in Europe." *Journal of Common Market Studies*, 57(5), 1071–1090. <https://doi.org/10.1111/jcms.12872>
- Briglauer, W., Dürr, N., & Gugler, K. (2021). "A retrospective study on the regional benefits and spillover effects of high-speed broadband networks: Evidence from German counties." *International Journal of Industrial Organization*, 74, Article 102677. <https://doi.org/10.1016/j.ijindorg.2020.102677>
- Briglauer, W., Krämer, J., & Palan, N. (2024). *Socioeconomic benefits of high-speed broadband availability and service adoption: A survey*. Telecommunications Policy, 48(7), 102808. <https://doi.org/10.1016/j.telpol.2024.102808>
- Briglauer, W., Cambini, C., Gugler, K., & Sabatino, L. (2025). *Economic benefits of new broadband network coverage and service adoption: Evidence from OECD member*

states. Industrial and Corporate Change, 00, 1–26.
<https://doi.org/10.1093/icc/dtae043>

Calandro, E., Gillwald, A.; Moyo, M. & Stork, C. (2013). *Comparative ICT sector performance review*.

Canzian, G., Poy, S., Schüller, Simone, 2019. Broadband upgrade and firm performance in rural areas: quasi-experimental evidence. *Regional Science and Urban Economics*. 77.

Crandall, R., Jackson, C., & Singer, H. (2003). *The Effect of Ubiquitous Broadband Adoption on Investment, Jobs, and the U.S. Economy*. Washington DC: Criterion Economics.

Crandall, R. Lehr, W. and Litan, R. (2007). *The Effects of Broadband Deployment on Output and Employment: A Cross-sectional Analysis of U.S. Data*.

Czernich, N., Falck, O., Kretschmer, T., & Woessmann, L. (2011). *Broadband infrastructure and economic growth*. The Economic Journal, 121(552), 505–532.

Deller, S., Whitacre, B., & Conroy, T. (2021). Rural broadband speeds and business startup rates. *American Journal of Agricultural Economics*.

Devereux, M (2006). *The impact of taxation on the location of capital, firms and profit: a survey of empirical evidence*. Oxford University Centre of Business Taxation. Working paper WP 07/02.

Devereux, M.P. and Freeman, H. (1995) “The impact of tax on foreign direct investment: empirical evidence and the implications for tax integration schemes” *International Tax and Public Finance*, 2, 85-106.

Farooq, U. (2021). “Corporate Tax Rate, Financing Policy and Investment Decisions: Evidence from 8 Asian Economies”, *Review of Public Economics* 50/3.

FCC (2019), *2019 Broadband Deployment Report*. Available in:
<https://www.fcc.gov/reports-research/reports/broadband-progress-reports/2019-broadband-deployment-report>

FCC (2024). *National Broadband Map*. Available in:
<https://broadbandmap.fcc.gov/home>

Feldstein, M. and Jun, J. (1986) “The Effects of Tax Rules on Nonresidential Fixed Investment: Some Preliminary Evidence from the 1980s,” in Feldstein, M., (ed.) *The effects of taxation on capital accumulation*. Chicago: University of Chicago Press.

Ford, G. S. (2018). Is faster better? Quantifying the relationship between broadband speed and economic growth. *Telecommunications Policy*, 42(9), 766-777.

Forman, C., Goldfarb, A., & Greenstein, S. (2012). The Internet and local Wages: A Puzzle. *American Economic Review*, 102, 556-575.

Gillett, S., Lehr, W., Osorio, C., and Sirbu, M. A. (2006). *Measuring Broadband's Economic Impact*. Technical Report 99-07-13829, National Technical Assistance, Training, Research, and Evaluation Project.

Greenstein, S. and McDevitt, R. C. (2009), *The Broadband Bonus: Accounting for broadband Internet's impact on US GDP*. Available at <http://www.kellogg.northwestern.edu/faculty/greenstein/images/htm/Research/WP/Broadband%20Bonus%20-%20GreensteinMcDevitt.pdf>.

Greenstein and McDewitt (2011) Greenstein, S. and McDevitt, R. C. (2009), *The global broadband bonus: Broadband Internet's impact on seven countries*. Available at http://ictlinkedworld.com/eng/pdfs/ICT_Chapter_II_B.pdf Accessed 1st October 2011

Greenstein, S. and R. McDevitt (2012), "Measuring the Broadband Bonus in Thirty OECD Countries", *OECD Digital Economy Papers*, No. 197, OECD Publishing. <http://dx.doi.org/10.1787/5k9bcwkg3hwhf-en>

Grubert, H. and Mutti, J. (2000) "Does taxes influence where U.S. corporations invest?", *National Tax Journal*, vol. 53, issue 4, 825-40.

Hardy, T. (1980). "The role of the telephone in Economic Development", *Telecommunications Policy*, 4 (4), pp.278-286.

Hasbi, M., 2020. Impact of very high-speed broadband on company creation and entrepreneurship: empirical evidence. *Telecommunications Policy* 44 (3) Article 101873.

Jensen, R. (2007). "The Digital Divide: Information (Technology), Market Performance, and Welfare in the South Indian Fisheries Sector". *Quarterly Journal of Economics*, 122 (3), 879-924.

Jun, J. (1994). *How taxation affects foreign direct investment (country-specific evidence)*, Policy Research Working Paper 1307, Washington DC: World Bank.

Hanappi, T., Millot, V. and Turban, S. (2023). *How Does Corporate Taxation Affect Business Investment? Evidence from aggregate and firm-level data*. OECD Economics Department Working Papers No. 1765. Paris: OECD Publishing.

Kandilov, I. T., & Renkow, M. (2010). Infrastructure investment and rural economic development: an evaluation of USDA's broadband loan program. *Growth and Change*, 41(2), 165-191.

Karner, J and Onyeji, R. (2007). *Telecom Private Investment and Economic Growth: the case of African and Central & East European Countries*. Jonkoping International Business School

Katz, R.L., Zenhausern, P., and Suter, S. (2008). *An evaluation of socio-economic impact of a fiber network in Switzerland*, mimeo, Polynomics and Telecom Advisory Services, LLC

Katz, R. and Suter, S. (2009), *Estimating the Economic Impact of the Broadband Stimulus Plan*. Available at http://www.elinoam.com/raulkatz/Dr_Raul_Katz_-_BB_Stimulus_Working_Paper.pdf

Katz, R. L., Vaterlaus, S., Zenhäusern, P. & Suter, S. (2010). The Impact of Broadband on Jobs and the German Economy. *Intereconomics*, 45 (1), 26-34.

Katz, R. L., Avila, J. and Meille, G. (2010). *Economic impact of wireless broadband in rural America*. Washington, D.C.: Rural Cellular Association

Katz, R. (2011). *Impacto Económico de Vive Digital*. Bogotá, Colombia: CINTEL.

Katz, R. (2012a). *The Impact of Broadband on the Economy: Research to date and Policy Issues*. Geneva: International Telecommunication Union

Katz, R. and Koutroumpis, P. (2012b). "The economic impact of telecommunications in Senegal", *Digiworld Economic Journal*, no. 86, 2nd Q.

Katz, R., Flores-Roux, E., Callorda, F. (2010). *Assessment of the economic impact of taxation of communication investment in the United States: a report to the Broadband Tax Institute*. October

Katz, R. and Koutroumpis, P. (2013). "Measuring digitization: a growth and welfare multiplier". *Technovation* 33 (10), 314-319, 2013. Katz, R. & Callorda, F. (2013). *Assessment of the economic impact of the repeal of the tax exemption on telecommunication investment in Minnesota*. New York: Telecom Advisory Services, December.

Katz, R. and Callorda, F. (2014). *Assessment of the Economic Impact of Telecommunications in Senegal (2003-2014)*. Columbia Institute for Tele-information Working Paper.

Katz, R., Flores-Roux, E. & Callorda, F. (2017). *Retornos y Beneficios generados por el sector de las telecomunicaciones en América Latina*. Cet.la and Telecom Advisory Services LCC.

Katz, R. and Callorda, F. (2018). *The economic contribution of broadband, digitization and ICT regulation*. Geneva, International Telecommunication Union (https://www.itu.int/en/ITU-D/Regulatory-Market/Documents/FINAL_1d_18-00513_Broadband-and-Digital-Transformation-E.pdf).

Katz, R., Callorda, F. (2019). *Assessment of the economic impact of taxation on communications investment in the United States: a report to the Broadband Tax Institute*. November

Katz, R. and Callorda, F. (2020). *Assessing the economic potential of 10G networks*. New York: Telecom Advisory Services.

Katz, R. and Jung, J. (2022). "The Role of Broadband Infrastructure in Building Economic Resiliency in the United States during the COVID-19 Pandemic". *Mathematics* **2022**, 10, 2988. <https://doi.org/10.3390/math10162988>

Katz, R. and Jung, J. (2023) "The Impact of Taxation in the Telecommunications Industry." *Information Economics and Policy* Volume 62 March 2023, 101016.

Katz, R. (2025). *The impact of digital transformation of the economy. Econometric modelling*. Geneva: International Telecommunication Union.

Katz, R., Briglauer, W., Jung, J. and Valencia, R. (2024). *Economic impact of Washington State submarine cable*. New York: Telecom Advisory Services.

Katz, R., Jung, J., Callorda, F. and Valencia, R. (2024). *An assessment of Wi-Fi economic value in the United States*. Telecom Advisory Services.

Kolko, J. (2010). Does Broadband Boost Local Economic Development? (Public Policy Institute of California Working paper). Retrieved from www.ppic.org/content/pubs/report/R_110JKR.pdf.

Kongaut, C. and Bohlin, E. (2014). *Impact of broadband speed on economic outputs: An empirical study of OECD countries*, 25th European Regional Conference of the International Telecommunications Society (ITS), Brussels, Belgium, 22-25 June 2014, International Telecommunications Society (ITS), Brussels.

Koutroumpis, P. (2009). "The Economic Impact of Broadband on Growth: A Simultaneous Approach". *Telecommunications Policy*, 33, 471-485.

Koutroumpis, P., Lekatsas, A., Giaglis, G., & Kourouthanasis, P. (2011). Between a rock and a hard place: Recession and telecoms taxation. *Telecommunications Policy*, 35(7), 681-688.

Liebenau, J., Atkinson, R. Kärrberg, P., Castro, D. and Ezell, S. (2009). *The UK's Digital Road to Recovery*. LSE Enterprise Ltd. & the Information Technology and Innovation Foundation.

Lintner, J. (1954), *Corporate Income Taxes: Their Effect on Investment*. Proceedings of the Academy of Political Science, Vol. 25, No. 4, The American Economy, Keystone of World Prosperity, pp. 14-26.

Liu, Y-H; Prince, J., and Wallsten, J. (2018). *Distinguishing bandwidth and latency in households' willingness-to-pay for broadband internet speed.*

Lobo, B. J., Alam, M. R., & Whitacre, B. E. (2020). "Broadband speed and unemployment rates: Data and measurement issues." *Telecommunications Policy*, 44(1), Article 101829. <https://doi.org/10.1016/j.telpol.2019.101829>

Mackey, S. (2011). "A Growing Burden: Taxes and Fees on Wireless Service." *State Tax Notes*.

Mack, E. (2014). Businesses and the need for speed: The impact of broadband speed on business presence. *Telematics and Informatics*, Volume 31, Issue 4, 2014, Pages 617-627.

Mack, E. and Faggian, A. (2013). Productivity and broadband: The human factor. *International Regional Science Review*, 36(3), 392-423.

Mack, E. A., & Rey, S. J. (2014). An Econometric Approach for evaluating the linkages between Broadband and Knowledge Intensive Firms. *Telecommunications Policy*, 38, 105-118.

Mackey, S. and Henchman, J. (2018). "Wireless Taxes and Fees Climb Again in 2018". *Tax Foundation Fiscal*, December, No. 626

Mansour, M. (1998). *The Calculation of Marginal Effective Tax Rates*, Washington, DC: International Monetary Fund.

McLure, Ch. (1970). "Taxation, substitution and Industrial Location", *Journal of Political Economy*, vol. 78, No. 1 (Jan-Feb), pp. 112-132

Metcalf, G. (2009). "Investment in Energy Infrastructure and the Tax Code." *Tax Policy and the Economy*, 2009.

Nevo, A., Turner, J., and Williams, J. (2016) "Usage-based pricing and demand for residential broadband", *Econometrica*, vol. 84, No.2 (March), 441-443.

OECD (2014). *Addressing the tax challenges of the Digital Economy*. Paris: OECD Publishing.

Ohrn, E. (2018). "The Effect of Corporate Taxation on Investment and Financial Policy: Evidence from the DPAD,"

Park Associates (2024). *Average U.S. Internet Home Had 17 Connected Devices in 2023. January 10*. Retrieved in: <https://www.parksassociates.com/blogs/in-the-news/parks-average-us-internet-home-had-17-connected-devices-in-2023>

Roller, L-H. and Waverman, L. 2001, "Telecommunications Infrastructure and Economic Development: A Simultaneous Approach," *American Economic Review*,

vol. 96, No. 4, pp.909–23 Available at:
<http://www.rau.ro/intranet/Aer/2001/9104/91040909.pdf>

Rohman, Bohlin, E. (2013). *Socio-economic effects of broadband speed*. Ericsson 3/221 01-FGB 101 00003.

Rosston, G., Savage, S. and Waldman, D. (2010), *Household demand for broadband internet service*. Available at
http://siepr.stanford.edu/system/files/shared/Household_demand_for_broadband.pdf.

Savage, S. J. and Waldman, D. (2004), "United States Demand for Internet Access", *Review of Network Economics*, Vol. 3(3), pp.228–47.

Shideler, D., Badasyan, N., and Taylor, L. (2007, September 28-30). "The economic impact of broadband deployment in Kentucky". *Telecommunication Policy Research Conference*, Washington D.C.

Slemrod, J. (1990). "Tax effects on Foreign Direct Investment in the United States: evidence from a cross-country comparison", in A. Razin and J. Slemrod (eds.) *Taxation in the Global Economy*, Chicago: University of Chicago Press, pp. 79-117.

Stork, C., & Esselaar, S. (2018). *OTT and other ICT sector taxes*. Research ICT Solutions.

Van Parys, S. and James, S. (2009). "Why Tax Incentives May Be an Ineffective Tool to Encouraging Investment? – The Role of Investment Climate," *SSRN Electronic Journal*. Retrieved from <https://hdl.handle.net/10161/29221>.

Vartia, L. (2008). *How Do Taxes Affect Investment and Productivity? An Industry-Level Analysis of OECD Countries*. Pais: OECD Publishing

Talpos, I. and Vancu, I. (2009). "Corporate Income Taxation Effects on Investment decisions in the European Union", *Annales Universitatis Apulensis Series Oeconomica*, 11 (1), pp. 513-518

Whitacre, B., Gallardo, R., & Strover, S. (2014). Broadband' s contribution to economic growth in rural areas: Moving towards a causal relationship. *Telecommunications Policy*, 38(11), 1011-1023.

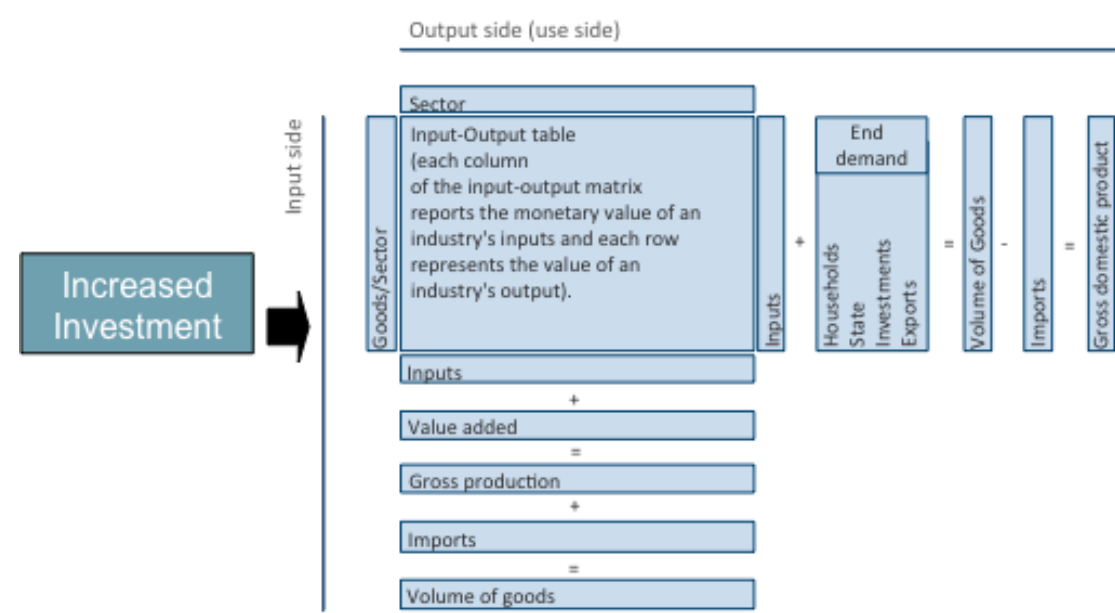
Zamil, F., & Hossen, M. M. (2012). Problems and prospects of telecommunication sector of Bangladesh: A critical review. *The International Institute for Science, Technology and Education*, 4(1): 16-25.

Appendix A. Input / Output Methodology

This methodology focuses on determining how much value added and employment is generated through the investment in communications networks. Input-output tables enable the calculation of the impact of additional inputs in specific sectors on the economy as a whole. The relationships between the sectors at the inputs stage trigger additional demand and thus increase production in other sectors. The sum of all these effects is the multiplier for the total volume of goods. Multipliers can be calculated in several ways and also for several economic dimensions. There are, for example, goods-related multipliers for the total volume of goods in an economy, for the value of total production or for the value added. There are also multipliers for labor market parameters such as the size of the workforce or the number of hours worked.

Once the investment input is calculated, the estimation of employment and output effects can be done. Input-output tables help calculating the direct, indirect, and induced effects of broadband network construction on employment and production. The interrelationship of these three effects can be measured through multipliers, which estimate how one unit change on the input side effects total employment change throughout the economy (see Figure A.1).

Figure A.1. Conceptual Framework of the Input-Output Analysis



To calculate employment effects resulting from communications investment, we relied on the input-output matrix published by Bureau of Economic Analysis. However, in order to be utilized in this analysis, the input-output matrices needed to be formatted to calculate the employment multipliers. Once the table is reformatted, one calculates the multipliers. From the I/O-table it is possible to obtain multipliers for total industry supply and additional variables as value added and employment. The calculation of the multipliers for the total industry supply uses the direct requirement table, which is also called Leontief-Inverse. The direct requirement table (DR) is calculated by the following formula:

$$DR = (I - A)^{-1} \text{ with } A = I/O\text{-table} / \text{total industry supply}$$

(division of each cell of intermediate domestic supply by total industry supply) I = Identity matrix

The sum of the columns per industry reflects the increase of the total industry supply by one additional unit of demand in this specific sector. A correction for the share of imports on total industry supply results in the total domestic production of the industries. The multiplying of the share of value added of total domestic industry production results in the value-added multiplier. Using labor productivity, it is possible to calculate the job effects now.

Appendix B. State Sales Tax Rate (2019-2024) *

State	Year	Wireless	Wireline	Cable
Alabama	2019	6.14%	6.14%	9.14%
Arizona	2019	0.00%	0.00%	8.37%
Arkansas	2019	9.43%	9.43%	9.43%
California	2019	8.56%	8.56%	8.56%
Colorado	2019	7.63%	7.63%	7.63%
Connecticut	2019	0.00%	0.00%	0.00%
Delaware	2019	0.00%	0.00%	0.00%
D. C.	2019	0.00%	0.00%	6.00%
Florida	2019	7.05%	7.05%	7.05%
Georgia	2019	7.29%	7.29%	7.29%
Idaho	2019	6.03%	6.03%	6.03%
Illinois	2019	8.74%	8.74%	8.74%
Indiana	2019	0.00%	0.00%	0.00%
Kansas	2019	8.67%	8.67%	8.67%
Kentucky	2019	6.00%	6.00%	6.00%
Louisiana	2019	9.45%	9.45%	9.45%
Maryland	2019	6.00%	6.00%	6.00%
Massachusetts	2019	6.25%	6.25%	6.25%
Michigan	2019	0.60%	0.60%	6.00%
Minnesota	2019	0.00%	0.00%	0.00%
Mississippi	2019	7.07%	7.07%	7.07%
Missouri	2019	0.00%	0.00%	8.13%
Montana	2019	0.00%	0.00%	0.00%
Nebraska	2019	6.85%	6.85%	6.85%
Nevada	2019	8.14%	8.14%	8.14%
New Jersey	2019	0.00%	0.00%	0.00%
New Mexico	2019	7.82%	7.82%	7.82%
New York	2019	0.00%	0.00%	8.49%
North Carolina	2019	0.00%	0.00%	0.00%
Ohio	2019	0.00%	0.00%	0.00%
Oklahoma	2019	8.92%	8.92%	8.92%
Oregon	2019	0.00%	0.00%	0.00%
Pennsylvania	2019	0.00%	0.00%	0.00%
Rhode Island	2019	7.00%	7.00%	7.00%
South Carolina	2019	7.43%	7.43%	0.00%
South Dakota	2019	6.40%	6.40%	6.40%
Tennessee	2019	9.47%	9.47%	9.47%
Texas	2019	5.69%	5.69%	5.69%
Utah	2019	0.00%	0.00%	6.94%
Virginia	2019	5.65%	5.65%	0.00%
Washington	2019	9.17%	9.17%	9.17%
Wisconsin	2019	5.44%	5.44%	5.44%
Wyoming	2019	5.36%	5.36%	5.36%
USA	2019	5.16%	5.43%	5.40%
Alabama	2020	6.22%	6.22%	9.22%
Arizona	2020	0.00%	0.00%	8.40%
Arkansas	2020	9.47%	9.47%	9.47%
California	2020	8.66%	8.66%	8.66%
Colorado	2020	7.65%	7.65%	7.65%
Connecticut	2020	0.00%	0.00%	0.00%
Delaware	2020	0.00%	0.00%	0.00%
D. C.	2020	0.00%	0.00%	6.00%
Florida	2020	7.05%	7.05%	7.05%

State	Year	Wireless	Wireline	Cable
Georgia	2020	7.31%	7.31%	7.31%
Idaho	2020	6.03%	6.03%	6.03%
Illinois	2020	9.08%	9.08%	9.08%
Indiana	2020	0.00%	0.00%	0.00%
Kansas	2020	8.68%	8.68%	8.68%
Kentucky	2020	6.00%	6.00%	6.00%
Louisiana	2020	9.52%	9.52%	9.52%
Maryland	2020	6.00%	6.00%	6.00%
Massachusetts	2020	6.25%	6.25%	6.25%
Michigan	2020	0.60%	0.60%	6.00%
Minnesota	2020	0.00%	0.00%	0.00%
Mississippi	2020	7.07%	7.07%	7.07%
Missouri	2020	0.00%	0.00%	8.18%
Montana	2020	0.00%	0.00%	0.00%
Nebraska	2020	6.93%	6.93%	6.93%
Nevada	2020	8.32%	8.32%	8.32%
New Jersey	2020	0.00%	0.00%	0.00%
New Mexico	2020	7.82%	7.82%	7.82%
New York	2020	0.00%	0.00%	8.52%
North Carolina	2020	0.00%	0.00%	0.00%
Ohio	2020	0.00%	0.00%	0.00%
Oklahoma	2020	8.94%	8.94%	8.94%
Oregon	2020	0.00%	0.00%	0.00%
Pennsylvania	2020	0.00%	0.00%	0.00%
Rhode Island	2020	7.00%	7.00%	7.00%
South Carolina	2020	7.46%	7.46%	0.00%
South Dakota	2020	6.40%	6.40%	6.40%
Tennessee	2020	9.53%	9.53%	9.53%
Texas	2020	5.69%	5.69%	5.69%
Utah	2020	0.00%	0.00%	7.18%
Virginia	2020	5.65%	5.65%	0.00%
Washington	2020	9.21%	9.21%	9.21%
Wisconsin	2020	5.46%	5.46%	5.46%
Wyoming	2020	5.34%	5.34%	5.34%
USA	2020	5.43%	5.36%	5.54%
Alabama	2021	6.22%	6.22%	9.22%
Arizona	2021	0.00%	0.00%	8.40%
Arkansas	2021	9.51%	9.51%	9.51%
California	2021	8.68%	8.68%	8.68%
Colorado	2021	7.72%	7.72%	7.72%
Connecticut	2021	0.00%	0.00%	0.00%
Delaware	2021	0.00%	0.00%	0.00%
D. C.	2021	0.00%	0.00%	6.00%
Florida	2021	7.08%	7.08%	7.08%
Georgia	2021	7.32%	7.32%	7.32%
Idaho	2021	6.03%	6.03%	6.03%
Illinois	2021	8.82%	8.82%	8.82%
Indiana	2021	0.00%	0.00%	0.00%
Kansas	2021	8.69%	8.69%	8.69%
Kentucky	2021	6.00%	6.00%	6.00%
Louisiana	2021	9.52%	9.52%	9.52%
Maryland	2021	6.00%	6.00%	6.00%
Massachusetts	2021	6.25%	6.25%	6.25%
Michigan	2021	0.60%	0.60%	6.00%
Minnesota	2021	0.00%	0.00%	0.00%
Mississippi	2021	7.07%	7.07%	7.07%

State	Year	Wireless	Wireline	Cable
Missouri	2021	0.00%	0.00%	8.25%
Montana	2021	0.00%	0.00%	0.00%
Nebraska	2021	6.94%	6.94%	6.94%
Nevada	2021	8.23%	8.23%	8.23%
New Jersey	2021	0.00%	0.00%	0.00%
New Mexico	2021	7.83%	7.83%	7.83%
New York	2021	0.00%	0.00%	8.52%
North Carolina	2021	0.00%	0.00%	0.00%
Ohio	2021	0.00%	0.00%	0.00%
Oklahoma	2021	8.95%	8.95%	8.95%
Oregon	2021	0.00%	0.00%	0.00%
Pennsylvania	2021	0.00%	0.00%	0.00%
Rhode Island	2021	7.00%	7.00%	7.00%
South Carolina	2021	7.46%	7.46%	0.00%
South Dakota	2021	6.40%	6.40%	6.40%
Tennessee	2021	9.55%	9.55%	9.55%
Texas	2021	5.69%	5.69%	5.69%
Utah	2021	0.00%	0.00%	7.19%
Virginia	2021	5.73%	5.73%	0.00%
Washington	2021	9.23%	9.23%	9.23%
Wisconsin	2021	5.43%	5.43%	5.43%
Wyoming	2021	5.33%	5.33%	5.33%
USA	2021	5.42%	5.55%	5.42%
Alabama	2022	6.24%	6.24%	9.24%
Arizona	2022	0.00%	0.00%	8.37%
Arkansas	2022	9.47%	9.47%	9.47%
California	2022	8.82%	8.82%	8.82%
Colorado	2022	7.77%	7.77%	7.77%
Connecticut	2022	0.00%	0.00%	0.00%
Delaware	2022	0.00%	0.00%	0.00%
D. C.	2022	0.00%	0.00%	6.00%
Florida	2022	7.01%	7.01%	7.01%
Georgia	2022	7.37%	7.37%	7.37%
Idaho	2022	6.02%	6.02%	6.02%
Illinois	2022	8.73%	8.73%	8.73%
Indiana	2022	0.00%	0.00%	0.00%
Kansas	2022	8.71%	8.71%	8.71%
Kentucky	2022	6.00%	6.00%	6.00%
Louisiana	2022	9.55%	9.55%	9.55%
Maryland	2022	6.00%	6.00%	6.00%
Massachusetts	2022	6.25%	6.25%	6.25%
Michigan	2022	0.60%	0.60%	6.00%
Minnesota	2022	0.00%	0.00%	0.00%
Mississippi	2022	7.07%	7.07%	7.07%
Missouri	2022	0.00%	0.00%	8.30%
Montana	2022	0.00%	0.00%	0.00%
Nebraska	2022	6.94%	6.94%	6.94%
Nevada	2022	8.23%	8.23%	8.23%
New Jersey	2022	0.00%	0.00%	0.00%
New Mexico	2022	7.72%	7.72%	7.72%
New York	2022	0.00%	0.00%	8.52%
North Carolina	2022	0.00%	0.00%	0.00%
Ohio	2022	0.00%	0.00%	0.00%
Oklahoma	2022	8.99%	8.99%	8.99%
Oregon	2022	0.00%	0.00%	0.00%
Pennsylvania	2022	0.00%	0.00%	0.00%

State	Year	Wireless	Wireline	Cable
Rhode Island	2022	7.00%	7.00%	7.00%
South Carolina	2022	7.44%	7.44%	0.00%
South Dakota	2022	6.40%	6.40%	6.40%
Tennessee	2022	4.78%	4.78%	4.78%
Texas	2022	5.70%	5.70%	5.70%
Utah	2022	0.00%	0.00%	7.20%
Virginia	2022	0.00%	0.00%	0.00%
Washington	2022	9.29%	9.29%	9.29%
Wisconsin	2022	5.43%	5.43%	5.43%
Wyoming	2022	5.36%	5.36%	5.36%
USA	2022	5.27%	5.52%	5.12%
Alabama	2023	6.25%	6.25%	9.25%
Arizona	2023	0.00%	0.00%	8.37%
Arkansas	2023	9.46%	9.46%	9.46%
California	2023	8.82%	8.82%	8.82%
Colorado	2023	7.78%	7.78%	7.78%
Connecticut	2023	0.00%	0.00%	0.00%
Delaware	2023	0.00%	0.00%	0.00%
D. C.	2023	0.00%	0.00%	6.00%
Florida	2023	7.02%	7.02%	7.02%
Georgia	2023	7.40%	7.40%	7.40%
Idaho	2023	6.02%	6.02%	6.02%
Illinois	2023	8.82%	8.82%	8.82%
Indiana	2023	0.00%	0.00%	0.00%
Kansas	2023	0.00%	0.00%	0.00%
Kentucky	2023	6.00%	6.00%	6.00%
Louisiana	2023	9.55%	9.55%	9.55%
Maryland	2023	6.00%	6.00%	6.00%
Massachusetts	2023	6.25%	6.25%	6.25%
Michigan	2023	0.60%	0.60%	6.00%
Minnesota	2023	0.00%	0.00%	0.00%
Mississippi	2023	7.07%	7.07%	7.07%
Missouri	2023	0.00%	0.00%	8.33%
Montana	2023	0.00%	0.00%	0.00%
Nebraska	2023	6.95%	6.95%	6.95%
Nevada	2023	8.23%	8.23%	8.23%
New Jersey	2023	0.00%	0.00%	0.00%
New Mexico	2023	7.72%	7.72%	7.72%
New York	2023	0.00%	0.00%	8.52%
North Carolina	2023	0.00%	0.00%	0.00%
Ohio	2023	0.00%	0.00%	0.00%
Oklahoma	2023	8.98%	8.98%	8.98%
Oregon	2023	0.00%	0.00%	0.00%
Pennsylvania	2023	0.00%	0.00%	0.00%
Rhode Island	2023	7.00%	7.00%	7.00%
South Carolina	2023	7.43%	7.43%	0.00%
South Dakota	2023	6.40%	6.40%	6.40%
Tennessee	2023	0.00%	0.00%	0.00%
Texas	2023	5.70%	5.70%	5.70%
Utah	2023	0.00%	0.00%	7.23%
Virginia	2023	0.00%	0.00%	0.00%
Washington	2023	8.86%	8.86%	8.86%
Wisconsin	2023	5.43%	5.43%	5.43%
Wyoming	2023	5.36%	5.36%	5.36%
USA	2023	5.06%	5.17%	4.86%
Alabama	2024	6.29%	6.29%	9.29%

State	Year	Wireless	Wireline	Cable
Arizona	2024	0.00%	0.00%	8.38%
Arkansas	2024	9.45%	9.45%	9.45%
California	2024	8.85%	8.85%	8.85%
Colorado	2024	7.81%	7.81%	7.81%
Connecticut	2024	0.00%	0.00%	0.00%
Delaware	2024	0.00%	0.00%	0.00%
D. C.	2024	0.00%	0.00%	6.00%
Florida	2024	7.00%	7.00%	7.00%
Georgia	2024	7.38%	7.38%	7.38%
Idaho	2024	6.03%	6.03%	6.03%
Illinois	2024	8.85%	8.85%	6.00%
Indiana	2024	0.00%	0.00%	0.00%
Kansas	2024	0.00%	0.00%	0.00%
Kentucky	2024	6.00%	6.00%	6.00%
Louisiana	2024	9.56%	9.56%	9.56%
Maryland	2024	6.00%	6.00%	6.00%
Massachusetts	2024	6.25%	6.25%	6.25%
Michigan	2024	0.60%	0.60%	6.00%
Minnesota	2024	0.00%	0.00%	0.00%
Mississippi	2024	7.06%	7.06%	7.06%
Missouri	2024	0.00%	0.00%	8.38%
Montana	2024	0.00%	0.00%	0.00%
Nebraska	2024	6.97%	6.97%	6.97%
Nevada	2024	8.24%	8.24%	8.24%
New Jersey	2024	0.00%	0.00%	0.00%
New Mexico	2024	7.62%	7.62%	7.62%
New York	2024	0.00%	0.00%	8.53%
North Carolina	2024	0.00%	0.00%	0.00%
Ohio	2024	0.00%	0.00%	0.00%
Oklahoma	2024	8.99%	8.99%	8.99%
Oregon	2024	0.00%	0.00%	0.00%
Pennsylvania	2024	0.00%	0.00%	0.00%
Rhode Island	2024	7.00%	7.00%	7.00%
South Carolina	2024	7.50%	7.50%	0.00%
South Dakota	2024	6.11%	6.11%	6.11%
Tennessee	2024	0.00%	0.00%	0.00%
Texas	2024	5.70%	5.70%	5.70%
Utah	2024	0.00%	0.00%	7.23%
Virginia	2024	0.00%	0.00%	0.00%
Washington	2024	9.38%	9.38%	9.38%
Wisconsin	2024	5.70%	5.70%	5.70%
Wyoming	2024	5.44%	5.44%	5.44%
USA	2024	5.40%	5.17%	4.71%

(*) Data for Alaska, Hawaii, Iowa, Maine, New Hampshire, North Dakota, Vermont, and West Virginia are excluded due to a lack of complete CAPEX data for at least one technology.

APPENDIX C. Methodology to construct State-Year Broadband's Price using the FCC Urban Rate Survey

The state-level price panel is constructed from the Federal Communications Commission's Urban Rate Survey (URS) fixed-broadband microdata as released by the Office of Economics & Analytics / Industry Analysis Division on the URS "Data & Resources" page. The URS samples residential fixed broadband offers in urban census tracts using a probability design and is employed by the FCC to generate national "reasonable comparability" benchmarks rather than official state averages. Accordingly, all estimates developed here should be interpreted as state-level descriptors for urban markets, not as official statewide statistics. Each observation in the URS carries a final weight—reflecting the design weight together with adjustments for nonresponse and service-level factors—and these weights are applied in our analysis. The key variables are the plan's "total monthly charge" (the recurring monthly price inclusive of required fees and surcharges as reported to the URS) and the plan's monthly usage allowance measured in gigabytes, with "unlimited" recorded explicitly.

For each state and survey year, three mutually consistent price controls are defined over nested speed thresholds that correspond to minimum advertised download rates of at least 10 Mbps, 25 Mbps, and 100 Mbps. The admissible set for any given threshold comprises all plans meeting or exceeding that threshold, so that, for example, a 300 Mbps offer is eligible for the ≥ 10 Mbps, ≥ 25 Mbps, and ≥ 100 Mbps groups simultaneously. To enhance cross-plan comparability and dampen volatility driven by small data caps, the analysis restricts attention to plans with monthly allowances of at least 500 GB or with explicitly unlimited usage; unlimited plans always qualify under this criterion.

Within each state-year and for each speed threshold, the summary statistic is the weighted median of the total monthly charge across all qualifying plans, computed with the URS final weights. This choice yields a robust measure of the "typical" price to access each speed tier in urban areas: relative to a mean, it is less sensitive to outliers and temporary promotional pricing, and relative to a minimum, it avoids undue influence from idiosyncratically low observations that may not be broadly available.

After the three medians are computed for a given state-year, one deterministic internal-consistency constraint is imposed on the reported schedule: a monotonicity constraint that requires non-decreasing prices in speed: $\text{Price}(\geq 10 \text{ Mbps}) \leq \text{Price}(\geq 25 \text{ Mbps}) \leq \text{Price}(\geq 100 \text{ Mbps})$. This adjustment governs only the final reported controls by threshold; it does not modify the underlying microdata or the primary median computations.

Two caveats need to be raised. Because the URS sampling frame is restricted to urban census tracts, the resulting controls characterize urban price conditions and should not be generalized as comprehensive statewide averages. Moreover, the URS weighting scheme is optimized for national benchmarking rather than precise subnational estimation, so the state-level figures presented here serve as descriptive controls rather than as official FCC state prices. Finally, each state-year control is aligned to the URS survey cycle corresponding to the relevant public release; the files

are drawn from the “Results and Data from previous Surveys” listings on the URS Data & Resources page. Source: FCC Urban Rate Survey (URS), Office of Economics & Analytics / Industry Analysis Division, “Data & Resources” page.