

**Before the  
FEDERAL COMMUNICATIONS COMMISSION  
Washington, DC 20554**

In the Matter of

The D.C. Circuit Court of Appeal  
Decision in *Verizon v. FCC*, and What  
Actions the Commission Should Take,  
Consistent with its Authority under  
Section 706 and all other Available  
Sources of Commission authority, in  
Light of the Court's Decision

GN Docket No. 14-28

Declaration

of

**LEE L. SELWYN**

on behalf of NASUCA

September 17, 2014

## DECLARATION OF LEE L. SELWYN

### EXECUTIVE SUMMARY

A June 2014 paper authored by University of Pennsylvania Law School Prof. Christopher Yoo, “U.S. vs. European Broadband Development: What Do the Data Say?” has been cited by a number of the larger broadband access providers and their trade associations in support of the proposition that the current treatment of broadband access as “information services” subject to limited regulation under Title I of the *Communications Act* has resulted in greater investment in broadband infrastructure and greater availability of high-speed broadband services in the United States than has been experienced in Europe, where Title II type common carrier regulation has remained in effect. Prof. Yoo presents various data that purports to provide comparisons of conditions extant in the US and in Europe to support this proposition, as well as econometric analyses consisting of several multiple linear regression models that purport to demonstrate a statistically significant relationship between the type of regulatory treatment and the overall extent of “Next Generation Access” (“NGA”) high-speed broadband coverage. The operative distinction between the US and European regulatory treatment of broadband is the requirement under European-style regulation, that incumbent providers make access to elements of their broadband infrastructures available on an unbundled basis for use by rival providers to promote “service-based competition” for broadband access. In the US, incumbent broadband providers (cable and telco) are not required to, and generally do not, make components of their broadband networks available to rivals, thus limiting competitive entry into the broadband access market to companies that are prepared to invest in their own facilities-based networks.

I have been asked by the National Association of State Utility Consumer Advocates (NASUCA) to review Prof. Yoo’s data and regression analyses and to assess the extent to which they actually support his core conclusion – i.e., that the apparently greater extent of broadband development extant in the US vis-à-vis Europe is, and from a policy perspective should be, attributed to the specific regulatory approach being applied to broadband in the US. From my review of Prof. Yoo’s analysis, I have identified a number of serious flaws in his regression model specification, such that the model and results cannot support the conclusions he purports to have reached. Apart from issues of methodology, there are questions about the accuracy and comparability of the data presented by Prof. Yoo, which questions are noted below.

Perhaps the most glaring deficiency in Prof. Yoo’s regression model stems from the fact that the analysis he used to conclude that US-style “facilities-based competition” results in greater NGA coverage does not actually include any US data. In reaching his conclusion, Prof. Yoo relies exclusively upon observations drawn from European countries, all of which have adopted the “service-based competition” regulatory regime. The US is not included in Prof. Yoo’s regression analysis at all. As such, it is simply not possible for Prof. Yoo’s model to have

demonstrated the relationship he claims to have identified. This error by itself provides a fully sufficient basis to dismiss Prof. Yoo's contentions.

However, the flaws in Prof. Yoo's analysis do not end with this already-fatal defect. The Yoo model suffers from a number of other data and model specification problems that render the analysis completely unreliable.

- **The model fails to adequately account for the passage of time.** Prof. Yoo has constructed a so-called "panel model" that combines cross-sectional and time series data for two consecutive years (2011 and 2012) in an effort to overcome the limited number of observations (countries) in his dataset. However, he fails to demonstrate that these two years are representative of a long term pattern or trend. Nor do these data allow Prof. Yoo to account for the lag in time between the effectuation of regulatory policy and investment in the marketplace. These two years of data may actually be anomalous: While Prof. Yoo finds that the US is ahead in broadband deployment in 2012, his data show just the opposite for 2011, with Europe leading the US.
- **The policy variables upon which the model is based are misspecified.** The explanatory variables in the model that purportedly account for regulatory policy do not provide valid indicia or representations of the regulatory distinction and nuance that Prof. Yoo seeks to examine. It is not apparent why "new entrants' market share of DSL lines" is or should be a valid indicator of the regulatory regime in a country and/or that country's level of service-based competition. Prof. Yoo provides no evidence to support this presumption.
- **The model suffers from omitted variable bias.** Prof. Yoo fails to control for the presence and magnitude of government subsidies, the specifics of the individual regulatory regimes, wireless spectrum allocation practices, the preexisting competitive landscape, the length of time a country has been subject to EU regulatory requirements, or any of the myriad of macroeconomic factors that materially impact broadband investment. In its current incarnation, Prof. Yoo's model could not actually account for all of these factors even if he had attempted to identify and acquire such additional data, since the small number of observations included in the analysis limits the number of degrees of freedom in the model, and thus the number of possible variables that can be included in the analysis. The failure to include these material variables in the model results in statistically biased and unreliable results.
- **The model fails to correctly apply the "panel data" methodology that it uses in order to overcome the small number of observations available for study.** In an attempt to overcome the limitations of using such a small number of observations, Prof. Yoo utilized a so-called "panel model" approach in which cross-sectional data for each of several time periods is examined. In this case, however, he used panel data across some 27 countries but for only two consecutive years, and failed to control either for fixed effects or for country-

specific differences. It is standard practice to control both for time and for entity (country in this case) in panel data analysis, yet Prof. Yoo controlled only for the two time points (2011 and 2012), and did not even acknowledge this defect. This failure is likely a function of the frailties of the small data set used by Prof. Yoo.

Prof. Yoo's regression analyses and comparative data do not support any of the conclusions that he claims to have reached, and for this reason should be afforded no weight by the Commission in addressing and resolving the important legal and policy matters at issue in this proceeding.

# DECLARATION OF LEE L. SELWYN

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- 1 Yoo Regression Data
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- 3 Replication of the Yoo models with and without country population weightings

## **Attachment**

- 1 Statement of Qualifications – Lee L. Selwyn

## DECLARATION OF LEE L. SELWYN

1 I, Lee L. Selwyn, declare as follows:

2

3 **Qualifications, background and experience**

4

5 1. My name is Lee L. Selwyn. I am President of Economics and Technology, Inc. (“ETI”),  
6 One Washington Mall, 15th Floor, Boston, Massachusetts 02108. ETI is a research and  
7 consulting firm specializing in telecommunications economics, regulation and public policy. My  
8 Statement of Qualifications is annexed hereto as Attachment 1 and is made a part hereof.

9

10 2. I hold a Ph.D. degree in Management from the Alfred P. Sloan School of Management,  
11 Massachusetts Institute of Technology. I also hold a Master of Science degree in Industrial  
12 Management from MIT and a Bachelor of Arts degree with Honors in Economics from Queens  
13 College of the City University of New York. In 1970, I was awarded a Post-Doctoral Research  
14 Grant in Public Utility Economics under a program sponsored by the American Telephone and  
15 Telegraph Company, to conduct research on the economic effects of telephone rate structures  
16 upon the computer time-sharing industry. This work was conducted at Harvard University’s  
17 Program on Technology and Society, where I was appointed a Research Associate. I was also a  
18 member of the faculty at the College of Business Administration at Boston University from 1968  
19 through 1973, where I taught courses in economics, finance and management information  
20 systems. I founded my firm, Economics and Technology, Inc., in January 1972, and have served  
21 as its President continuously since that date.

22

1           3. I have been actively and continuously involved in the fields of telecommunications  
2 economics, policy and regulation since the late 1960s. I have provided expert testimony and  
3 analysis on telecommunications economics, technology, rate design, service cost analysis,  
4 market structure, form of regulation, and numerous other telecommunications issues before more  
5 than forty state public utility commissions, the Federal Communications Commission, the United  
6 States Congress, and regulatory bodies in a number of foreign countries, on behalf of  
7 commercial organizations, non-profit institutions, and local, state and federal government  
8 authorities. Attachment 1 to this Declaration provides a complete record of my prior expert  
9 testimony and appearances before regulatory agencies and courts.

10

11           4. I have had extensive experience with the analysis of telecommunications services costs  
12 and production processes. This work has involved detailed examinations of the nature and  
13 structure of such costs and of the types and quantities of resources that are required for the  
14 provision of these services. I have studied a broad spectrum of telecom services, including  
15 wireline local and long distance services, mass market and specialized dedicated services, retail  
16 and wholesale services, wireless (cellular) services, broadband distribution and delivery services,  
17 and services provided using legacy analog and digital technologies as well as those provided via  
18 the Internet or involving Internet Protocol. I have published several articles dealing specifically  
19 with Net Neutrality and related Open Internet issues, including “Revisiting the Regulatory Status  
20 of Broadband Internet Access: A Policy Framework for Net Neutrality and an Open Competitive  
21 Internet,” (with Helen E. Golding), *Federal Communications Law Journal*, Vol. 63 Num. 1,  
22 December 2010. I have also contributed chapters to two recent American Bar Association

1 publications, “Network Industry Markets: Telecommunications” (with Helen E. Golding),  
2 Chapter X in *Market Definition in Antitrust: Theory and Case Studies*, ABA Section of  
3 Antitrust Law (2012), at pp. 411-436, and “Economic Underpinnings: The Economics of  
4 Communications Networks, Market Power, and Vertical Foreclosure Theories” (with Helen E.  
5 Golding et al), Chapter I in *Telecom Antitrust Handbook, Second Edition*, ABA Section of  
6 Antitrust Law (2013), at pp. 1-61.

7

8       5. I have submitted expert reports and testimony in numerous telecommunications  
9 regulatory proceedings before the Federal Communications Commission (“FCC”) and state  
10 public utilities commissions in approximately forty states dating back to the late 1960s, dealing  
11 with a broad range of ratesetting and policy matters, including switched and special access  
12 charges, price cap regulation, Sec. 251/252 interconnection and unbundling requirements, total  
13 service resale and wholesale pricing, universal service, broadband and related Internet access  
14 issues, intercarrier compensation, spectrum allocation, handset interoperability, CMRS early  
15 termination fees, and many others.

16

17       6. In addition to my various professional activities, I am an elected Town Meeting Member  
18 in the Town of Brookline, Massachusetts, and serve on the Town’s Advisory and Finance  
19 Committee and on the Town’s Audit Committee, and have recently served on a special Tax  
20 Override Study Committee.

21

1 **Assignment**  
2

3 7. I have been asked by the National Association of State Utility Consumer Advocates  
4 (NASUCA) to review Prof. Yoo’s data and regression analyses and to assess the extent to which  
5 they actually support his core conclusion – i.e., that the purportedly greater extent of broadband  
6 development extant in the US vis-à-vis Europe is, and from a policy perspective should be,  
7 attributed to the specific regulatory approach that has been applied to broadband in the US.  
8

9 **The Yoo regression analysis**  
10

11 8. A June 2014 paper authored by University of Pennsylvania Law School Prof. Christopher  
12 Yoo, “U.S. vs. European Broadband Development: What Do the Data Say?”<sup>1</sup> has been cited by a  
13 number of the large broadband access providers and their trade associations, including Comcast,  
14 Verizon, NCTA, Cox and Charter,<sup>2</sup> in support of the proposition that the current treatment of  
15 broadband access as “information services” subject to limited regulation under Title I of the  
16 *Communications Act* has resulted in greater investment in broadband infrastructure and greater  
17 availability of high-speed broadband services in the United States than has been experienced in  
18 Europe, where Title II type common carrier regulation has remained in effect. Prof. Yoo

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1. Yoo, Christopher S., *U.S. vs. European Broadband Deployment: What Do the Data Say?* University of Pennsylvania Law School, 2014 (“Yoo paper”), available at <https://www.law.upenn.edu/live/files/3352-us-vs-european-broadbanddeployment>. The paper states that financial support for it was provided by Broadband for America, an organization opposing reclassification of broadband Internet access as a Title II telecommunications service. The Broadband for America website identifies only one specific member, the U.S. Cattlemen’s Assn. See, <http://www.broadbandforamerica.com/about/mission> (visited 9/9/14). There may be others, but their identities are not disclosed. The Yoo paper itself does not appear to have been submitted for the record in the FCC’s *Open Internet* docket.

2. Comcast *Comments*, at 47-48; Verizon *Comments*, at 14; NCTA *Comments*, at 9, 12, 21, 24; Cox *Comments*, at 35; Charter *Comments*, at 8.

1 presents various data that purports to provide comparisons of conditions extant in the US and in  
2 Europe to support this proposition, as well as econometric analyses consisting of several  
3 multiple linear regression models that purport to demonstrate a statistically significant  
4 relationship between the type of regulatory treatment and the overall extent of “Next Generation  
5 Access” (“NGA”) high-speed broadband coverage. The operative distinction between the US  
6 and European regulatory treatment of broadband that is being examined by Prof. Yoo is the  
7 requirement, under European-style regulation, that incumbent providers make access to elements  
8 of their broadband infrastructures available on an unbundled basis for use by rival providers in  
9 their offering of retail services to consumer and commercial end users, thereby promoting  
10 “service-based competition” for broadband access. In the US, incumbent broadband providers  
11 (cable and, with limited exceptions, ILECs) are not required to, and generally do not, make  
12 components of their broadband networks available to rivals, thus limiting competitive entry into  
13 the broadband access market to companies that are able to build their own facilities-based  
14 networks.<sup>3</sup>

15

16 **The data underlying the Yoo paper and regression model is extremely limited and, as such,**  
17 **provides overly simplistic, inconsistent and selective comparisons of conditions extant in**  
18 **the US and Europe.**

19

20 9. Prof. Yoo has compiled certain data that, he claims, demonstrates that the development  
21 of high-speed broadband access (“Next Generation Access” or “NGA”) has progressed further in  
22 the US than it has in Europe. Using a set of multiple linear regression models that he developed

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3. In certain situations, large ILECs may be required to provide unbundled *copper* loops that have no fiber segment to competitors for the provision of DSL. However, given the speed and distance limitations for DSL provisioned over all-copper loops, this rarely occurs in practice.

1 based upon data that he has deemed relevant, Prof. Yoo attempts to ascribe the apparently  
2 superior level of broadband deployment and availability in the US that his data suggest exists  
3 specifically to the approach to broadband regulation that has been adopted in the US. Prof. Yoo  
4 explains that the US regulatory model requires that competition for broadband service be  
5 “facilities-based,” where the new entrant is required to acquire the investment capital necessary  
6 to fund the construction of a broadband network infrastructure that the provider will use to  
7 deliver broadband Internet access services to consumers and businesses within its operating  
8 territory.

9

10 10. Facilities-based broadband providers in the US are generally not required to, and do not,  
11 make elements of their network available to rival providers on an unbundled basis. The US  
12 experience, according to Prof. Yoo, is in stark contrast to the regulatory regime extant in Europe,  
13 where entrants may engage in “service-based” competition by leasing elements of the incumbent  
14 facilities-based provider’s network for resale to end-user customers. Prof. Yoo concludes that:

15

16 Disparities between European and U.S. broadband networks stemmed from  
17 differing regulatory approaches. Europe has relied on regulations that treat  
18 broadband as a public utility and focus on promoting service-based  
19 competition, in which new entrants lease incumbents’ facilities at wholesale  
20 cost (also known as unbundling). The U.S. has generally left buildout,  
21 maintenance, and modernization of Internet infrastructure to private companies  
22 and focused on promoting facilities-based competition, in which new entrants  
23 are expected to construct their own networks. Regression analysis indicates  
24 that the U.S. approach has proven more effective in promoting NGA coverage  
25 than the European approach.<sup>4</sup>

26

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4. Yoo, at 1.

1           11. The Yoo paper itself did not reproduce any of the underlying data upon which the  
2 regression analysis was based, nor did it provide the model specifications themselves. On  
3 August 19, 2014, I contacted Prof. Yoo and requested this material, which he graciously  
4 provided. Exhibit 1 hereto contains the dataset that he had used for the four different regression  
5 analyses that he describes, and Exhibit 2 provides the model specifications themselves. Using  
6 this data and model specifications, I have been able to reproduce Prof. Yoo's results for Models  
7 (1), (3) and (4), but the results I have obtained with respect to his Model (2) do not match the  
8 results reported in the paper.

9

10           12. Reduced to its essentials, the Yoo paper presents two main conclusions:

11

12           (1) Broadband development and availability in the US, both with respect to coverage  
13 and bandwidth, has outpaced that of Europe; and

14

15           (2) The higher level of broadband availability in the US is specifically attributable to  
16 the regulatory environment in the US, which relies exclusively upon "facilities-  
17 based" competitive entry, vs. the European "service-based competition" approach  
18 in which entrants are enabled to obtain wholesale unbundled access to the  
19 incumbent provider networks, thereby enabling them to compete at the retail level  
20 without the massive facilities investments that are necessary under the US  
21 approach.

22

1 **The data upon which Prof. Yoo bases his various conclusions provides "apples-to-oranges"**  
2 **comparisons that are often inapposite to the specific claim that his paper is seeking to**  
3 **support.**  
4

5 13. I have not undertaken a detailed examination of the comparative data upon which Prof.  
6 Yoo relies in support of his first conclusion – that US broadband development and availability  
7 has outpaced Europe – to verify its accuracy or consistency; however, from my review of the  
8 summary charts and data provided in the paper, I have concerns as to the specific consistency  
9 and comparability of the US and European data that he has compiled.

10  
11 14. Prof. Yoo presents as Figure 5 a comparison of “Investment per Household in the  
12 Electronic Communications Sector in the U.S. and Europe, 2007–2012,”<sup>5</sup> but then goes on to  
13 treat that *Electronic Communications Sector* data as if it is confined strictly to *broadband*. Then,  
14 based on that mischaracterization, Prof. Yoo leaps to the conclusion that “[t]he data on  
15 broadband investment reveals a stark disparity between the U.S. and Europe,” claiming that  
16 “[f]rom 2007 to 2012, per household investment in the U.S. more than doubled per household  
17 investment levels in Europe.”<sup>6</sup> But as Prof. Yoo also readily notes, “the electronic communica-  
18 tions sector ... includes fixed-line telecommunications, mobile telecommunications, and pay  
19 television, among other things”<sup>7</sup> It includes broadband, but in an unknown amount, and it is thus  
20 not possible to use this Sector-wide data to reach *any* valid conclusion as to the relative level of  
21 *broadband-specific* investment in the US vs. the EU. Moreover, from his descriptions, it is not

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5. *Id.*, at 13.

6. *Id.*, at 14.

7. *Id.*, at 13.

1 at all clear that the US and European data have even been obtained from consistent or  
2 comparable sources, or that the definitions of “electronic communications” are comparable as  
3 between the US and the EC. As noted, Prof. Yoo concedes that the EC’s electronic  
4 communications sector definition “includes ... pay television [and] other things.”<sup>8</sup> He explains  
5 that, “[a]lthough the U.S. government does not collect similar data, the U.S. Telecom  
6 Association compiles total broadband investments based on financial reports filed by leading  
7 providers.”<sup>9</sup> There is no basis to assume that these disparate data sources are comparable, that  
8 the same types of asset categories and companies have been included in each data series, that  
9 comparable accounting treatments have been utilized on both sides of the Atlantic, that the scope  
10 of the “leading provider” data compiled by USTA mirrors that of the EC, or that the manner in  
11 which government subsidies are treated in the valuations has been reconciled so as to make the  
12 US and European investment data directly comparable. And the chart itself does not even  
13 identify the currency unit being displayed or the manner in which the different currencies (US  
14 dollars, Euros, UK Pounds, Swiss Francs, etc.) were converted (i.e., using exchange rates as of  
15 some (unspecified) date, Purchasing Power Parities (“PPPs”) as of some unspecified date, or  
16 some other procedure).

17

18 15. Further compounding the potential for undocumented inconsistencies between US and  
19 EC data, and as Prof. Yoo himself notes,<sup>10</sup> there are widespread subsidies provided both at the  
20 national and in some cases at the municipal level in Europe to support broadband infrastructure

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8. *Id.*, citations omitted.

9. *Id.*, citations omitted.

10. See, e.g., Yoo, at 25, 29, 34, 43 and 44.

1 development;<sup>11</sup> yet if the European data compiled by Prof. Yoo is limited to private sector  
2 investment, such subsidies may not have been fully reflected in the US/European comparisons.  
3 Indeed, inasmuch as download speeds (Figure 6) and broadband adoption rates (Figure 7) are  
4 roughly comparable for the US and Europe, it is difficult to see how the Europeans could have  
5 achieved this outcome at levels of investment that, according to Prof. Yoo's Figure 5, are  
6 running at less than half of those in the US.

7

8 16. As another example, Prof. Yoo's Figure 11 presents a "European Study of Pricing of  
9 Standalone Broadband in the U.S. and Europe, 2012." He notes that the study "attempts to take  
10 into account contract length, data caps, nonrecurring costs, promotions, differences in volume  
11 and other services, VAT, and purchasing power parity" but does not specify how, precisely, such  
12 factors were actually "taken into account." In the US, broadband Internet access is exempt from  
13 all local sales and federal excise taxes under the federal *Internet Tax Freedom Act* ("ITFA").<sup>12</sup>  
14 In most, if not all, European countries, Internet access is subject to a Value Added Tax ("VAT")  
15 that varies from country to country and can range as high as 15% to 25%.<sup>13</sup> Simply eliminating  
16 the VAT from the European prices is not a sufficient solution either, since corporate tax rates are  
17 considerably higher in the US than in Europe,<sup>14</sup> a potential source of price differences as well,

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11. Some government subsidies may occasionally be available in the US, but to a far more limited extent than in Europe.

12. P.L. 105-277, 112 Stat. 2681-719.

13. European Commission, *VAT Rates Applied in the Member States of the European Union, Situation at 1st July 2014*, Ref. Ares(2014)2087537 - 25/06/2014, at 3.

14. VAT is an alternative approach to taxation that is widely used outside of the US. In countries with VAT-based tax structures, income taxes are typically lower than in the US especially when both federal and state income  
(continued...)

1 and we have no information as to the tax treatment of infrastructure assets as between the US  
2 and Europe, not to mention across the individual EU countries themselves. Moreover, a direct  
3 comparison of “Standalone Broadband” prices is in itself of dubious merit, since most US  
4 broadband services are being provided and purchased in bundles together with video and/or  
5 voice telephone service. European broadband services may similarly be offered in bundles, with  
6 the prices for such bundles on both sides of the Atlantic being influenced by such things as  
7 retransmission fees and other content costs.

8

9 17. Another problem in Prof. Yoo's data is that he does not take account of the differences  
10 *within* the European market. As one of the EC reports (on which Prof. Yoo relies) states:

11

12 Broadband markets in Europe are fragmented. Looking at any of the key indicators  
13 measuring coverage/availability and take-up of fixed, NGA and mobile broadband,  
14 there are significant differences across Member States.<sup>15</sup>

15

16 Although Prof. Yoo runs through a selection of European countries, he does not mention this  
17 caveat of the EC reports, nor does he discuss in sufficient detail the differences extant across the  
18 EC and, given their common regulatory model, offer any explanation as to why such differences  
19 are present.<sup>16</sup>

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14. (...continued)  
taxes are considered, and produce a commensurately lower share of total tax revenues.

15. EC Communications Commission Report of March, 2014 (referred to by Prof Yoo as "EC (2014a)," at 6  
(available at [http://ec.europa.eu/information\\_society/newsroom/cf/dae/document.cfm?doc\\_id=4590](http://ec.europa.eu/information_society/newsroom/cf/dae/document.cfm?doc_id=4590)).

16. In a similar vein, there are also significant differences in broadband availability across the US despite the  
common FCC-mandated regulatory model that applies uniformly throughout the US. As in Europe, the form of  
regulation by no means provides the predominant, let alone the sole, explanation for such differences in broadband  
availability as may exist at the present time.

1           18. Finally, throughout his paper, Prof. Yoo seems to conflate fixed-line and mobile  
2 broadband, sometimes including the latter, sometimes ignoring it. For example, his Figure 6,  
3 titled “Standard Broadband and NGA Adoption per Covered Household in the U.S. and Europe,  
4 2011 and 2012,” presents two sets of comparisons for 2011 vs. 2012. The first, labeled “All  
5 Fixed Broadband,” portrays a virtual dead heat between the US and Europe for both years, with  
6 the US slightly ahead. The second comparison, titled “NGA,” shows Europe slightly ahead of  
7 the US in 2011 but, for 2012, shows the US back in the lead.<sup>17</sup> Prof. Yoo attributes this “surge”  
8 in US NGA coverage to “an increase in the penetration in mobile wireless broadband providing  
9 NGA speeds from 0% of U.S. households [in 2011] to 7% of U.S. households [in 2012].”<sup>18</sup> Prof.  
10 Yoo’s regression models utilize a “Total NGA” dependent variable that may or may not include  
11 any mobile broadband. But since he has omitted any US data from his regression, the Total  
12 NGA for the US, and the fact that for 2012 it is running ahead of Europe, is certainly not  
13 captured in his analysis. Wireless broadband is not equivalent to, nor is it a substitute for, fixed  
14 line broadband; wireless cannot support the bandwidths, transmission quality, and traffic  
15 volumes typical of fixed line broadband.<sup>19</sup>  
16

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17. Yoo, at 14.

18. *id.*, at 15.

19. AT&T and Verizon are pushing wireless – including wireless broadband – as the sole option in areas of their service territory where they seek to withdraw wireline services and not deploy advanced facilities. In many of these situations, wireless is an inferior form of broadband due to issues like topography and dense vegetation, and broadband signals cannot be received at some locations or they might be available outside a building but not inside. By conflating the two forms of broadband, Prof. Yoo seems to be suggesting that all broadband – and broadband investment – is of equal quality and value to the customer. That is clearly not the case.

1           19. I leave it to others to dissect Prof. Yoo’s data in more detail. However, from my limited  
2 examination of the data underlying the regression models as well as the various comparison  
3 charts contained in the Yoo paper, the data upon which Prof. Yoo bases his various conclusions  
4 provides overly simplistic, and in many cases “apples-to-oranges” comparisons that are, in  
5 certain cases, inapposite to the specific claim that his paper is seeking to foster. For example,  
6 Prof. Yoo specifically recognizes that “[i]n terms of standard broadband, household adoption  
7 numbers in the U.S. and Europe are very high and very similar, with the U.S. being slightly  
8 ahead. Given the slow growth, it would appear that standard broadband adoption was nearing  
9 saturation in 2012.”<sup>20</sup> And, “[w]ith respect to NGA, adoption is still in its nascent stages.”<sup>21</sup>  
10 Notably, the comparative outcomes being reported by Prof. Yoo are highly sensitive to the  
11 particular time frame selected for the comparison, and to what types of services are included.  
12 Thus, he observes that “[t]he U.S. lagged slightly behind Europe in 2011, but surged ahead in  
13 2012, reaching 17% of households as compared with 14% NGA penetration in Europe. The  
14 primary driver was an increase in the penetration in mobile wireless broadband providing NGA  
15 speeds from 0% of U.S. households to 7% of U.S. households.”<sup>22</sup> Notably, if Prof. Yoo had  
16 looked only at 2011 results, he would have concluded that Europe was ahead of the US in NGA  
17 development. By looking instead at 2012 figures, or by including mobile as well as fixed  
18 broadband, he would have reached precisely the opposite conclusion. Since only two years’  
19 worth of data has been selected for inclusion in the Yoo analysis, there is no direct way to tell  
20 whether the 2012 result putting the US ahead of Europe was an anomaly or a fluke – hardly a

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20. Yoo, at 15.

21. *Id.*

22. *Id.*

1 basis for assessing the correct regulatory paradigm And as noted above, inasmuch as adoption  
2 rates and download speeds appear to be virtually the same here and in Europe and that in any  
3 event some of the results may flip from one year to the next, it is difficult to accept the notion  
4 that the US is lagging behind, or that the seemingly large disparities in broadband investment per  
5 household are the result of policy differences rather than the non-comparability of the data.

6

7 **Prof. Yoo’s regression analysis does not support his conclusion that US regulatory policy**  
8 **“explains” the purportedly greater level of US broadband development.**

9

10 20. Even accepting for purposes of discussion that the data compiled by Prof. Yoo affords  
11 an accurate and directly comparable picture of conditions extant in both Europe and in the US,  
12 the regression analysis as described in the Yoo paper provides no support whatsoever for his  
13 second conclusion – i.e., that the seemingly higher level of broadband availability in the US is  
14 specifically attributable to the US regulatory policy of facilities-based competition.

15

16 21. Regression analysis is a statistical process for quantitatively estimating the relationships  
17 among variables. More specifically, regression analysis helps one understand how the value of  
18 the dependent variable changes when any one of the independent or explanatory variables  
19 changes while the other independent variables are held constant. It is a widely used and widely  
20 accepted economic analysis technique for prediction and forecasting. In undertaking a  
21 regression analysis, one begins by hypothesizing intuitive relationships as between a  
22 “dependent” variable and one or more “independent” or “explanatory” variables. Regression  
23 analysis then provides a mathematical process for testing the statistical validity of the  
24 hypothesized relationship or “model.” A key element of any such hypothesis is an assumption

1 of *causality*. In this instance, Prof. Yoo was seeking, specifically, “[t]o test the impact of  
2 service-based and facilities-based competition on NGA coverage.”<sup>23</sup> He explains that, while the  
3 US *Telecommunications Act of 1996* had originally provided for “service-based” competitive  
4 entry by “permitting competitors to share incumbent providers’ networks through local loop  
5 unbundling and wholesale access, ... [t]he U.S. soon soured on this idea ... [and] abandoned local  
6 loop unbundling in favor of a regulatory approach that focused on facilities-based  
7 competition.”<sup>24</sup> He explains that “European regulation, in contrast, has continued to emphasize  
8 the service-based competition by requiring carriers with significant market power to share their  
9 facilities through mechanisms such as local loop unbundling, shared access, and bitstream  
10 access.”<sup>25</sup> In fact, the regulatory policy regime extant throughout the EU is expressly directed at  
11 facilitating service-based competition, and by an explicit Directive of the European Parliament,  
12 *all* EU national regulatory agencies are *required* to adopt and to enforce such policies.<sup>26</sup> Thus,  
13 the causal relationship that Prof. Yoo hypothesizes, and that his regression analysis undertakes to  
14 test, is that US-style “facilities-based” competition produces superior NGA coverage than  
15 European-style “service-based” competition.

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23. *Id.*, at 10.

24. *Id.*, at 9.

25. *Id.*

26. See, *Directive 2002/19/EC of the European Parliament and of the Council of 7 March 2002 on access to, and interconnection of, electronic communications networks and associated facilities* (Access Directive) as amended by Directive 2009/140/EC (unofficially consolidated version), *Regulatory framework for electronic communications in the European Union, Situation in December 2009*, The Publications Office of the European Union. ISBN 978-92-79-14964-1 doi:10.2759/24096, at pp. 75-84. Available at <https://ec.europa.eu/digital-agenda/sites/digital-agenda/files/Copy%20of%20Regulatory%20Framework%20for%20Electronic%20Communications%202013%20NO%20CROPS.pdf>

1           22. In principle, that hypothesis is something that is amenable to testing via regression  
2 analysis. One would specify, as the dependent variable, an indicia of NGA coverage, for  
3 example, the number or the percentage of homes passed by NGA facilities, as Prof. Yoo has  
4 done here. Because factors other than the regulatory regime may also influence the extent of  
5 NGA development, the econometrician would undertake to identify and test, in addition to a  
6 “regulatory policy” variable reflective of the “facilities-based” vs. “service-based” approach,  
7 other explanatory variables that may also impact the dependent variable: the level of NGA  
8 coverage in this instance. One would also want to include within the data set observations  
9 associated with both of the regulatory regimes being examined, so that the outcomes of each in  
10 terms of NGA coverage, along with other contributing factors, could be evaluated.

11

12           23. Yet it is precisely in this regard that the Yoo model is fatally flawed, *because all of the*  
13 *observations in his sample are drawn exclusively from European countries all of which have*  
14 *adopted and are pursuing the same “service-based competition” policy.* It is simply not  
15 possible to apply regression analysis to test the outcome of Policy A (“facilities-based”  
16 competition) vs. Policy B (“service-based” competition) *when all of the observations upon which*  
17 *the regression model is based are from countries that have uniformly adopted the same Policy B.*  
18 Prof. Yoo might, perhaps, argue that inclusion of the US in the regression dataset would not have  
19 made much difference, in that it would be just one of 28 countries the remainder of which have  
20 adopted a service-based competition regulatory model. But that would miss the point: One  
21 cannot reasonably apply regression analysis to test the effect of two alternate policies if all, or  
22 virtually all, of the observations adhere to only one of them.

1 **The two policy variables that Prof. Yoo has defined do not provide a valid indicia or**  
2 **representation of the regulatory distinction whose results he seeks to examine.**  
3

4 24. In any event, while Prof. Yoo is seeking to attribute the purportedly greater level of  
5 NGA coverage that he claims to exist in the US to the adoption, in the US, of a regulatory  
6 regime in which all competition must be facilities-based, the dataset upon which his regression  
7 analysis is based is confined entirely to European countries all of which have adopted, in some  
8 form, a regulatory regime in which service-based broadband competition is supported and  
9 facilitated, and which *does not include the US at all*. Had he included a mix of countries some  
10 of which had adopted facilities-based competition while others were pursuing service-based  
11 competition, the “policy variable” could be defined as equal to “1” where the former approach  
12 was being used, or “0” where the latter approach was in place. But this is not what Prof. Yoo  
13 has done. Instead, he defined two policy variables, as follows:

14

15 • “The primary measure for service-based competition is the new entrants’ market share  
16 of DSL lines, which are presumably served by sharing the incumbent’s network.

17

18 • The primary measure of facilities-based competition is broadband coverage by standard  
19 cable.”<sup>27</sup>

20

21 *New entrants market share – Service Based competition.* It is not at all apparent as to why “the  
22 new entrants' market share of DSL lines” in particular is or should be a valid indicator of the

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27. *Id.*, citations omitted.

1 extent of service-based competition, and Prof. Yoo offers no empirical or other support for this  
2 proposition or for his “presumption” that these DSL lines are being “served by sharing the  
3 incumbent's network.” And even if that “presumption” were valid, the new entrants’ market  
4 share of DSL lines will be driven by any number of other factors including, but not limited to:

5

6 • the length of time that such “service-based” competitors have been in operation;

7

8 • the relationships between the wholesale prices being charged to “service-based” competitors  
9 and the retail prices being charged by the incumbent provider to its own retail customers;

10

11 • the nature of the operations support systems in place to facilitate wholesale purchases; and

12

13 • Contractual and then legal disputes.

14

15 In the years following the *1996 Act* when local loop unbundling was the official US policy,  
16 entrants were forced to engage in protracted litigation with uncooperative incumbent carriers in  
17 order to obtain access to unbundled wholesale services.<sup>28</sup>

18

19 *Facilities Based Competition – Broadband Coverage by Standard Cable*. As for Prof. Yoo’s  
20 “facilities-based” policy variable, in the very same paragraph he concedes that the extent of

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28. Indeed, when Prof. Yoo suggests that the US had “soured” on the idea of “permitting competitors to share incumbent providers’ networks through local loop unbundling and wholesale access,” he obscures the fact that this change in US policy was driven almost entirely by federal court rulings resulting from the persistent litigation initiated and pursued by the incumbent local exchange carriers themselves.

1 broadband coverage by standard cable is probably not material, in that “94% of all standard  
2 cable broadband in Europe and 92% of all standard cable broadband in the U.S. had already been  
3 upgraded to DOCSIS 3 by the end of 2012.”<sup>29</sup> Put differently, while the extent of broadband  
4 coverage by standard cable may, in and of itself, have some predictive property as to the overall  
5 extent of NGA development, as used in Prof. Yoo’s regression model it teaches nothing with  
6 respect to the impact of one regulatory regime vs. the other because the result was virtually the  
7 same under both.

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9 25. Prof. Yoo examined four alternative regression model specifications:

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- Specification (1) regresses the percentage of DSL provided by new entrants against NGA coverage;
- Specification (2) regresses the degree of standard cable coverage against NGA coverage;
- Specification (3) regresses both variables against NGA coverage to identify the factor(s) that most directly affect the availability of “Next Generation Access” (“NGA”) broadband;<sup>30</sup>
- Specification (4) isolates the competitive impact of cable broadband on incumbent telephone companies by eliminating Total NGA coverage as the dependent variable and replacing it with the sum of VDSL and FTTP. This new dependent variable does not include DOCSIS 3 coverage as one of its components and reflects only those aspects of NGA coverage that are spurred on by competition from cable.<sup>31</sup>

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29. *Id.*

30. *Id.*, at 11.

31. *Id.*

1 Yet none of these specifications contain a valid policy variable, and none include any instances  
2 of US-style regulation based upon facilities-based competition. Indeed, the stated objective of  
3 Specification (4) – to "reflect[] only those aspects of NGA coverage that are spurred on by  
4 competition from cable" – seems particularly distant from the effects of the specific regulatory  
5 policy differences that are purportedly being studied. That is, the extent of VDSL and HTTP  
6 deployment by incumbent local telephone companies may well be driven primarily by  
7 competition from cable – a result that would seem to be supported by the results of model (4) – ,  
8 but nothing in Prof. Yoo's analysis actually establishes that the extent of competition from cable  
9 bears any relationship to the choice of one or the other regulatory paradigm under examination.  
10 In short, the Yoo regression models are simply incapable of providing any assessment of the  
11 effect of US vs. European regulatory policies upon NGA investment, deployment, and coverage.

12

13 **Prof. Yoo's analysis inappropriately and incorrectly conflates fixed-line and mobile**  
14 **broadband both with respect to the data upon which he relies and as to the applicable**  
15 **regulatory treatment relevant to mobile services.**

16

17 26. As I have previously noted,<sup>32</sup> Prof. Yoo has included both US fixed-line and mobile  
18 NGA broadband in his comparison of US vs. European NGA coverage. Although the US data is  
19 excluded from the regression dataset, it is not clear whether or not the NGA coverage data for  
20 Europe, which is the dependent variable in the regression models, also includes both fixed-line  
21 and mobile, or fixed-line only. That notwithstanding, Prof. Yoo's characterization of US  
22 broadband policy as supporting only "facilities-based" competitive entry is specific to fixed-line  
23 broadband. The situation applicable to mobile wireless broadband is far more complex.

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32. Para, 15, *supra*.

1           27. In the US, there are currently four nationwide mobile facilities-based carriers (AT&T,  
2 Verizon, Sprint and T-Mobile) and several other facilities-based mobile carriers with more  
3 limited regional footprints. The FCC, in rejecting the AT&T/T-Mobile merger and, more  
4 recently, in less formally discouraging the Sprint/T-Mobile proposed merger that was recently  
5 withdrawn as a result, has made it clear that it would not allow less than four nationwide  
6 providers in the wireless market.<sup>33</sup> Whether or not FCC rules *require* that facilities-based mobile  
7 carriers provide non-facilities-based entrants with access to their networks, they all do so on a  
8 voluntary basis. This is because, with four nationwide carriers and the several smaller ones  
9 licking at their heels, the larger carriers – particularly nos. 3 and 4 (Sprint & T-Mobile) – are  
10 incited to expand their own distribution channels by entering into “Mobile Virtual Network  
11 Operator ” (“MVNO”) and similar resale and private branding deals with non-facilities-based  
12 providers (e.g., Wal-Mart’s Straight Talk Wireless, TracPhone). The one area where the FCC  
13 has gotten involved is in the case of roaming, where facilities-based carriers are generally  
14 required to enter into commercially reasonable roaming agreements with smaller carriers – and  
15 even with their nationwide rivals – to fill in gaps in their respective coverage. It is thus a gross  
16 oversimplification to view the US policy with respect to wireless as equivalent to that for fixed  
17 broadband. And although the competitive landscape and resale/roaming policies applicable to  
18 mobile broadband are still evolving relative to the conditions applicable to mobile voice, the  
19 trajectory is in the same general direction.

20

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33. In a statement issued August 6, 2014, FCC Chairman Tom Wheeler said “Four national wireless providers are good for American consumers. Sprint now has an opportunity to focus their efforts on robust competition.” FCC News Release, August 6, 2014, Chairman Wheeler Statement on Competition in the Mobile Marketplace, <http://www.fcc.gov/document/chairman-wheeler-statement-competition-mobile-marketplace>

1           28. It is of course, unclear as to whether and, if so, to what extent, mobile broadband  
2 availability has been included in any of the regression data. What is clear, however, is that the  
3 policy distinction being tested by Prof. Yoo does not accurately reflect the wireless situation in  
4 the US, and that in any event no US data has been included in the regression itself.

5

6 **Prof. Yoo's regression model fails to consider many relevant explanatory variables.**

7

8           29. As I noted earlier, regression analysis provides an understanding as to how the value of  
9 the dependent variable changes when any one of the independent or explanatory variables  
10 changes *while the other independent variables are held constant*. Thus, many factors may  
11 influence the extent of NGA coverage, but if the objective is to identify specifically how NGA  
12 coverage is affected by the choice of regulatory regime, those other factors will need to be  
13 identified and controlled for.

14

15           30. Yet all four of Prof. Yoo's regression model specifications only control for three  
16 country-specific attributes – GDP per capita, percentage of rural households, and total  
17 population. There are, however, many other potentially important country-specific attributes  
18 that would undoubtedly affect nationwide NGA and/or VDSL and FTTP coverage (Prof. Yoo's  
19 proxies for nationwide broadband coverage) none of which were addressed in his models.  
20 Macroeconomic literature identifies a variety of country-specific factors that are crucial to  
21 explaining cross-country income differences.<sup>34</sup> For example:

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34. See, e.g., Romer, D., "Cross-Country Income Differences," In *Advanced Macroeconomics* (4th ed.) (pp. 150-188). New York: McGraw-Hill, 2012.

- 1       • Social Infrastructure
- 2       • Security of property rights
- 3       • Human capital
- 4       • Physical capital
- 5       • Political system (capitalism vs. communism)
- 6       • Political stability
- 7       • Lack of corruption
- 8       • Norms of civic responsibility
- 9       • Ethnic diversity
- 10      • Geography

11

12 Some of these may be similar across all of the EU countries (for example, all are parliamentary  
13 democracies notwithstanding the fact that some are also constitutional monarchies). However,  
14 others are subject to wide variation across Europe. Prof. Yoo fails to control for any of these in  
15 his regression:

16

- 17 • **The geographic size of the country.** For example, one would expect that construction of a  
18 broadband network is a far simpler and far less costly undertaking in a small country such as  
19 Cyprus than in a large country such as France or Germany. The European NGA (Next  
20 Generation Access) mapping studies from which Prof. Yoo compiled his data indicates that  
21 Cyprus had no NGA coverage whatsoever in 2011 (0.0% coverage) yet just one year later,

1 in 2012, Cyprus was reported to have achieved NGA coverage of 73.1%.<sup>35</sup> A jump of this  
2 magnitude would be unthinkable in geographically larger countries. No geographic area  
3 variable was included in Prof. Yoo's data set.

4  
5 • **Terrain.** Construction costs are obviously impacted by the physical properties of a  
6 country's land area – mountains, rivers, climate, etc. The regulatory regime  
7 notwithstanding, the cost and time required to construct a broadband network will be  
8 significantly affected by these geographic properties. Prof. Yoo does not account for terrain  
9 is his analysis.

10  
11 • **The availability and extent of government subsidies.** Prof. Yoo presents “case studies” of  
12 eight European countries' broadband policies and deployment experience. With the  
13 exception of Denmark, he observes that all of the others in this group have provided  
14 subsidies, at the national or in some cases at the municipal level, to support broadband  
15 infrastructure development.<sup>36</sup> Government subsidies of this type are expressly intended to  
16 facilitate broadband infrastructure development by reducing the extent of required private  
17 sector investment and risk, and in so doing accelerating the pace of construction relative to

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35. European Commission (EC) (2012), *Broadband Coverage in Europe in 2011: Mapping Progress Towards the Coverage Objectives of the Digital Agenda*, available at [http://ec.europa.eu/information\\_society/newsroom/cf/document.cfm?doc\\_id=1102](http://ec.europa.eu/information_society/newsroom/cf/document.cfm?doc_id=1102) (visited 9/10/2014); European Commission (EC) (2013), *Broadband Coverage in Europe in 2012: Mapping Progress Towards the Coverage Objectives of the Digital Agenda*, available at [http://ec.europa.eu/information\\_society/newsroom/cf/dae/document.cfm?doc\\_id=3647](http://ec.europa.eu/information_society/newsroom/cf/dae/document.cfm?doc_id=3647) (visited 9/10/2014). It is also possible that these data are simply erroneous, which would potentially impact the overall reliability of Prof. Yoo's analysis.

36. Yoo, at 35.

1 where it might have been absent the subsidy. Clearly, the presence and value of any  
2 government subsidies will have a material and direct impact upon NGA coverage yet,  
3 despite being aware of their widespread use throughout the EU, Prof. Yoo failed to include  
4 or control for the availability and amount of broadband subsidies in any of his model  
5 specifications.

- 6
- 7 • **Other regulatory differences.** As previously noted, all of the countries in Prof. Yoo’s data  
8 set have adopted the European style “service-based competition” regulatory model.  
9 However, the manner in which each country has implemented and enforced that regime –  
10 and the length of time it has been in effect – likely varies widely across the continent. Since  
11 adoption of a “service-based competition” regulatory model is mandatory for all EU  
12 countries, the date at which each country was admitted to the EU would represent at least  
13 one source of country-specific regulatory variation. Apparently, Prof. Yoo recognizes the  
14 possibility of such variation in regulatory policy in that he has specified regulatory policy  
15 variables that could, arguably, capture the effects of such differences. However, the  
16 “percent of DSL provided by new entrants” and the “percent of standard cable availability”  
17 are themselves influenced by factors other than each country’s regulatory practices (such as  
18 the extent of incumbent DSL deployment, the availability of other broadband infrastructure  
19 alternatives, pricing, etc.) and their use necessitates a far more detailed understanding of  
20 those relationships than is present in the Yoo analysis or regression models.

- 21
- 22 • **Economic climate.** Although the GNP variable that Prof. Yoo includes in his models may  
23 account for static differences in income levels from country to country, it does not account

1 for the overall economic climate extant in each. In 2011 and 2012, Europe was still in the  
2 midst of its great recession, while the US was beginning to emerge from the downturn that  
3 had begun in 2008.<sup>37</sup> A number of European countries were faced with onerous sovereign  
4 debt and potential default, and had in a number of cases adopted various austerity measures  
5 that may have affected both public and private sector infrastructure investments. During the  
6 2000's decade Spain, for example, was experiencing considerable prosperity and was,  
7 among other things, engaged in the construction of a high-speed rail network. But when  
8 faced with the prospect of default on its debt, much of that infrastructure development effort  
9 came to an abrupt halt.<sup>38</sup> Nowhere in Prof. Yoo's model specifications does he include any  
10 economic climate variable or control for these types of national economic conditions.

- 11
- 12 • **Spectrum Policy.** One particularly important example of variation in regulatory policy  
13 from one European country to the next involves spectrum. Countries vary as to their  
14 policies regarding allocation of electromagnetic spectrum among competing demands – e.g.,  
15 broadcast television, mobile wireless services, public safety, national defense, among others.  
16 The availability of spectrum for wireless data services, specifically NGA data services such  
17 as LTE, will be a limiting (or enabling) factor in the buildout of NGA wireless services.

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37. Krugman, Paul, "The Austerity Debate," *The New York Times*, January, 2010,  
[http://www.nytimes.com/2012/01/30/opinion/krugman-the-austerity-debacle.html?\\_r=0&pagewanted=print](http://www.nytimes.com/2012/01/30/opinion/krugman-the-austerity-debacle.html?_r=0&pagewanted=print) (visited  
September 12, 2014); Krugman, Paul, "U.S. Chose Better Path to Recovery," *The New York Times*, May, 2012,  
<http://www.nytimes.com/2012/05/04/business/us-chose-better-path-to-economic-recovery.html=0&pagewanted=print>  
(visited September 12, 2014).

38. Taylor, Julien, "Spain's obsession with high-speed trains runs into budget reality," *Reuters*, June, 2013,  
<http://www.reuters.com/assets/print?aid=USL5N0EQ1KI20130617> (visited September 12, 2014); Govan, Fiona,  
"Spain cuts high speed 'ghost train,'" *The Telegraph*, June, 2011,  
<http://www.telegraph.co.uk/news/worldnews/europe/spain/8603392/Spain-cuts-high-speed-ghost-train.html> (visited  
September 12, 2014).

1 While Prof. Yoo includes LTE coverage in his analysis, he fails to control for this major  
2 factor in LTE deployment. Using Prof. Yoo’s case studies as a guide, if we compare the  
3 deployment of LTE in Sweden to the deployment of LTE in France, we confirm that there  
4 still remains wide variation in the deployment of LTE across the EU. Prof. Yoo  
5 characterizes Sweden as a “global leader in LTE” and suggests the reason for Sweden's  
6 success in deploying near country-wide LTE coverage by 2011 is a direct result of Sweden's  
7 quick adoption of spectrum auctions.<sup>39</sup> Sweden was the second country in Europe to hold  
8 auctions for 2.6 GHz (May 2008) and for 800 MHz (March 2011).<sup>40</sup> On the other hand,  
9 Prof. Yoo characterizes France as “lagg[ing] well behind the rest of Europe,” citing the fact  
10 that LTE coverage was 0% in 2011 and 6% in 2012.<sup>41</sup> Prof. Yoo again links the deployment  
11 of LTE directly to the timing of spectrum auctions, suggesting that, among other reasons,  
12 the fact that France did not allocate its 2.6 GHz spectrum until September 2011 hurt the  
13 extent of its of LTE coverage relative to other European countries.<sup>42</sup> He also suggests  
14 another reason why France is struggling relative to other countries – that third-generation  
15 HSPA+ networks used by French wireless providers have limited coverage, which has also  
16 contributed to lower levels of overall broadband coverage in France.<sup>43</sup> Prof. Yoo concedes  
17 that the timing of spectrum auctions and the extent of development of wireless networks

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39. Yoo, at 26.

40. *Id.*

41. *Id.*, at 29

42. *Id.*

43. *Id.*, at 29-30

1 within a given country can have significant effects upon overall LTE deployment; however,  
2 he fails to control for either of these effects in his models.

3  
4 • **Government initiatives to further develop broadband infrastructure.** A major  
5 difference between the US and Europe and even among European countries is the extent of  
6 government initiatives and subsidies to advance construction of broadband infrastructure. In  
7 addition to differences in subsidy levels, as Prof. Yoo has discussed at length in his eight  
8 “case study” discussions, there is substantial variation across European governments  
9 regarding both the extent of broadband development and the specific technology to be  
10 adopted. For example, Ireland’s “National Broadband Scheme” is funded by the  
11 government, while Spain has developed a public/private partnership to expand broadband  
12 coverage.<sup>44</sup> Some countries, such as Austria, France, Iceland, and the Netherlands, have  
13 chosen to pursue FTTP architecture, while others have instead adopted VDSL over existing  
14 copper infrastructure, or expansion of DOCSIS 3.0 in their cable infrastructures.<sup>45</sup> These are  
15 major policy differences that directly affect the cost, pace and extent of broadband  
16 deployment, and may well have a far greater impact than any differences in the alternative  
17 regulatory paradigms that Prof. Yoo has undertaken to analyze.

18  
19 • **Preexisting telecommunications competitive landscape.** For most European countries,  
20 the traditional approach to telecom had been through government-owned monopolies, often

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44. OCED Directorate for Science, Technology and Industry Committee for Information, Computer and Communications Policy (2008), *Broadband Growth and Policies in OCED. Countries*, OCED Ministerial Meeting on the Future of the Internet Economy, Seoul, Korea, June 2008.

45. *Id.*, at 35 and 50.

1 affiliated with the national postal service. Over the past several decades, most of these  
2 state-owned enterprises have been privatized, but at different times and with widely varying  
3 capitalizations.<sup>46</sup> Some of these now-private enterprises have aggressively pursued foreign  
4 investments and acquisitions, while others have remained close to their traditional national  
5 service areas. For example, Germany's deregulation, following the 1996 German Telecom  
6 Act, began with the privatization of former monopolies like Deutsche Telekom AG, a  
7 company that developed into a major multinational enterprise. In contrast, Belgium's  
8 largest wireless provider, Belgacom, is still a partially state-owned company and provides  
9 coverage mainly in western Europe. The timing and nature of the evolution of competition  
10 within each country has a material impact upon each country's level and rate of investment  
11 in new infrastructure, yet none of these factors were addressed or controlled for in the Yoo  
12 models.

13  
14 I have not attempted to suggest an exhaustive list of potential explanatory variables, and there  
15 may well be others. Moreover, not all of those I have listed above may prove to be statistically  
16 significant. However, these, and potentially others, should have been examined and evaluated,  
17 but were not.

18  
19 31. One of the reasons why Prof. Yoo had included only a handful of explanatory variables  
20 in each of his model specifications was due to the relatively small number of observations that  
21 were available in his data set. Regression analysis produces unreliable results when the number

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46. Bain & Company, *Next Generation Competition: Driving Innovation in Telecommunications*, Bain digital broadband infrastructure study, October 2009, at 23.

1 of independent variables approaches the number of individual observations in the data sample.  
2 Prof. Yoo had devised a so-called “cross-sectional” model construct, in which he used data from  
3 each of the 27 EU countries plus a few non-EU European states – Norway, Iceland, and  
4 Switzerland – excluding certain observations for which data was missing.<sup>47</sup> That would have  
5 provided only 27 or 28 observations. One way to overcome this small sample size problem is to  
6 utilize a technique known as a “panel model,” in which data for the same set of entities  
7 (countries, in this case) over several years are utilized. In this instance, Prof. Yoo did use a  
8 panel model, but employed a flawed design whose results are dubious at best. Prof. Yoo’s  
9 model utilized data for two years – 2011 and 2012. He had 27 observations for 2011 and 28 for  
10 2012, for a total of 55 observations. Such a “panel model” is a combination of a cross-sectional  
11 and a time-series model, and requires that both the “time” and the individual data entities  
12 (countries, in this instance) be controlled for. Thus, the panel model should have included a time  
13 variable (which it did) and one “dummy variable”<sup>48</sup> for each of the individual countries in the  
14 sample (which it did not). Notably, even in the absence of a panel model approach, the  
15 significant variation across the various EU countries with respect to the many attributes I have  
16 identified above (but which were not addressed in Prof. Yoo's study) required that some country-  
17 specific or perhaps attribute-specific variables be included in the specification *even under a*  
18 *straight cross-sectional approach*. However, where a panel model is used, entity-specific

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47. See Exhibit 1. It should be noted that Prof. Yoo’s description of the countries/states to be included in his analysis is inconsistent and erroneous. For example, Prof. Yoo attempted to include Croatia as an EU member country in 2012, even though Croatia was admitted to the EU on July 1, 2013. Similarly, Norway was to be omitted from the analysis as a non-EU member state, but appears to have been inadvertently included for one, but not both, years.

48. The term “dummy variable” is not pejorative. It is simply an indicator variable for the presence or absence of a particular trait. For example, when data comes from France, the French “dummy variable” would be set equal to 1. When the data came from another country, the French variable would be set equal to 0.

1 dummy variables would be considered a requirement when entity-specific effects are correlated  
2 with explanatory variables.<sup>49</sup> Thus, Prof. Yoo should have defined and included country-specific  
3 dummy variables so as to control for country specific effects, the absence of which is likely to  
4 have generated misleading results.

5

6 32. The panel data that Prof. Yoo had compiled spans only two years – and two *consecutive*  
7 *years* at that – which provides little evidence as to how either new entrants' share of market DSL  
8 or standard cable coverage may have affected NGA and VDSL and FTTP coverage over time.  
9 In order to properly estimate these effects, a more appropriate data set would either include more  
10 panels spanning a longer period of time, or two panels that are separated by a few years (rather  
11 than two consecutive panels).<sup>50</sup> Two reasons why two consecutive panels are inappropriate for  
12 measuring regulatory effects relate to controlling for the longevity of a country's broadband  
13 policies (regulation, subsidies, other factors) and the lagged effect that the implementation of  
14 such policies would have upon broadband coverage. The use of such a limited panel fails to  
15 adequately control for policies that have been in place for twenty years vs. those that have only  
16 been in place for one year. Moreover, the effects that new policies may have on market behavior  
17 may require an extended period of time to be observed, which is why regression models often  
18 seek to account for lagged effects.<sup>51</sup> In the case of NGA coverage, there is likely to be a

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49. Cameron, A. C., & P. K. Pravin, “Linear Panel Models: Basics,” *In Microeconometrics: Methods and Applications* (1st ed.) (pp. 697-740). New York: Cambridge University Press, 2005 (“Cameron & Pravin”), at 702-703.

50. Stock, J. H. & W. W. Watson, *Introduction to Econometrics* (3rd ed.). Boston: Addison-Wesley, 2011 (“Stock & Watson”), at 353-369.

51. *Id.*, at 520-582.

1 significant lag from the introduction of a policy to the time when that policy begins to affect  
2 broadband coverage. Prof. Yoo did not include any such lagged effects in his study.

3

4 33. One method econometricians use to control for entity- (or country-) specific effects is a  
5 fixed effects regression.<sup>52</sup> Essentially, fixed effects regressions control for any characteristics of  
6 an identified entity that do not typically change over time. For example, the geographic size of  
7 most European countries has been relatively stable since the end of World War II (notwithstand-  
8 ing the current situation in Ukraine and Russia); similarly, cultural norms are expected to remain  
9 relatively consistent over time. The fixed effects model is generally accepted as the baseline  
10 method to control for any unobservable entity-specific factors that may have an effect on the  
11 dependent variable (in this case NGA coverage) of a regression model. Failing to control for  
12 entity-specific effects can bias regression estimates if entity-specific effects are correlated with  
13 the independent variable(s) of a specified regression model.<sup>53</sup>

14

15 34. Prof. Yoo does not explain how the sample of countries used to estimate the final  
16 regression results was selected. The data provided to me by Prof. Yoo (reproduced in Exhibit 1)  
17 includes three non-EU countries – Norway, Iceland, and Switzerland – as well as some data for  
18 Croatia, which Prof. Yoo apparently, but incorrectly, believed had become a member of the EU

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52. *Id.*, at 354-358; see also, Glick, R. & R. Kenneth. “Global Versus Country-specific Productivity Shocks and the Current Account,” *Journal of Monetary Economics* 35(1), February, 1995, 159-192; Louzis, D. P., T. A. Vouldis & V. L. Metaxas, “Macroeconomic and Bank-specific Determinants of Non-performing Loans in Greece: a Comparative Study of Mortgage Business and Consumer Loan Portfolios,” No 118, Working Papers, Bank of Greece, 2010.

53. Cameron & Pravin, at 702-703.

1 in 2012. In fact, Croatia had not been admitted to the EU until July 1, 2013.<sup>54</sup> Data was thus  
2 collected for 31 countries over two years for a total of 62 observations, but the final regression  
3 data only included a total of 55 observations. In his paper, Prof. Yoo does not disclose which  
4 countries were included or excluded from his analysis, nor why.

5

6 35. Table 3 in the Yoo paper summarizes the results for the four model specifications that  
7 were evaluated by Prof. Yoo. In Specification (1), he includes only one of the two “policy”  
8 variables, in this case, the “Percentage DSL by New Entrants.” In that model, two of the four  
9 explanatory variables – Percentage Rural Households and GDP Per Capita – are not statistically  
10 significant at the 95% confidence level, the confidence level most commonly accepted by  
11 econometricians.<sup>55</sup> The time variable, Year, is significant at the 95% level, which is not  
12 particularly surprising inasmuch as the extent of NGA coverage in any given country will either  
13 be increasing or remain unchanged from one year to the next. The policy variable, Percentage  
14 DSL by New Entrants,” is significant at the 99% level. However, the overall model has an  $r^2$  of  
15 only 0.38, which is interpreted as indicating that the model “explains” only 38% of the variation  
16 in the dependent variable, NGA Coverage in this instance. In the second model, Prof. Yoo  
17 substitutes the alternate policy variable, Standard Cable Coverage, for Percent DSL. With that  
18 change, only the GDP Per Capita variable is found not to be statistically significant at the 95%  
19 level (again, Prof. Yoo notes that it is significant at the 90% level, below the generally accepted  
20 threshold). The  $r^2$  jumps to 0.89, making this model a far better fit to the data. However, as I

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54. [http://europa.eu/about-eu/countries/member-countries/croatia/index\\_en.htm](http://europa.eu/about-eu/countries/member-countries/croatia/index_en.htm) (visited September 10, 2014).

55. Stock & Watson, at 77-78.

1 discussed above, the “Standard Cable Coverage” variable, which seems to account for the vast  
2 improvement in specification (2) vs. (1), teaches nothing about the effect of “facilities-based” vs.  
3 “service-based” competition policy since, as Prof. Yoo has himself observed, the Standard Cable  
4 Coverage is virtually identical in both the US and in Europe and, in any event, has essentially  
5 nothing at all to do with the effects of facilities-based vs. service-based broadband competition.  
6

7 36. Prof. Yoo’s specification (3) includes both of his policy variables. The  $r^2$  drops slightly  
8 to 0.88, but in this model the Percentage DSL by New Entrants variable is no longer statistically  
9 significant (Prof. Yoo notes that it is significant at the 80% level, even further below the  
10 generally accepted minimum 95% threshold). Specification (3) thus corroborates the finding, in  
11 specification (2), that the principal driver of NGA coverage is Standard Cable Coverage, which  
12 of course has nothing whatsoever to do with the regulatory policy distinction that the Yoo model  
13 is intended to examine.  
14

15 **The exclusion of relevant explanatory variables causes the Yoo regression models to suffer**  
16 **from omitted variable bias.**  
17

18 37. Prof. Yoo’s regression models appear to suffer from omitted variable bias. Omitted  
19 variable bias causes a violation of the class linear regression model assumptions, leading to  
20 unreliable results. The effect of omitted variable bias is often the inflation of the coefficients for  
21 the included variables (and thus the measure of statistical significance). In other words, the  
22 results reported by Prof. Yoo are likely not the true value of the coefficients, and to the extent  
23 they were not already below standard levels, overstate the level of statistical significance that can  
24 be ascribed to each coefficient.

1           38. As I have discussed in detail above, there are numerous variables that have a basis in  
2 economic theory for inclusion in this study that were not included by Prof. Yoo. Even if Prof.  
3 Yoo had made an attempt to include such additional data, the small number of observations in  
4 the dataset (a frailty that Prof. Yoo acknowledges<sup>56</sup>) limits the number of explanatory variables  
5 that can be included before the statistical properties of the model cease to be meaningful.

6

7           39. Prof. Yoo's own results indicate that important variables have been omitted. Tables 3  
8 & 4 in the Yoo report, which display the author's regression results, show significant increases in  
9  $r^2$  from model specification (1) to model specification (3) after the addition of a single  
10 explanatory variable.<sup>57</sup> Such a substantial increase is often characteristic of omitted variable  
11 bias, and should have been a red flag to Prof. Yoo that the results from the first specified  
12 regression are questionable at best.<sup>58</sup>

13

14 **Several variables that have been defined in percentage terms have been inappropriately**  
15 **weighted by the total population of each country.**

16

17           40. Statistical weighting, the practice of changing the effect of an observation to reflect its  
18 importance or "weight," is appropriate in certain circumstances – but not here. Since both of  
19 Prof. Yoo's dependent variables are *percentages*, i.e. both represent the percentage of the

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56. Yoo, at page 9: "Although the number of observations is quite limited, the dataset reflects sufficient heterogeneity to support regression analysis of the impact of service-based and facilities-based competition on NGA coverage." Not really. The "number of observations" is actually so small as to preclude the inclusion of many highly relevant explanatory variables, thus creating omitted variable bias.

57. Yoo, at 11.

58. Stock & Watson, at 234-235

1 country's population with coverage, it is simply methodologically incorrect to then also weight  
2 the regression by total population. Indeed, it is hard to imagine, and there is no theoretical basis  
3 to believe, that the success or failure of a regulatory policy should be more important in  
4 countries with larger populations. If the dependent variable used in the regression was instead  
5 specified as the total number of people (or households) with coverage, then weighting the  
6 regression by total population might be appropriate. Thus, had Prof. Yoo used quantities of lines  
7 instead of percentages, a weighted model would normalize for different populations – e.g., Malta  
8 vs. the UK. However, the use of percentages accomplishes this same normalization. Thus, the  
9 correct approach when using percentage data is to not use country population weights.

10

11 41. I have undertaken to reproduce the Yoo model in two ways: as he had presented it, i.e.,  
12 with country population weights, and without such weights.<sup>59</sup> Prof. Yoo's incorrect use of  
13 weighted data produces a higher correlation and seemingly better statistical properties – higher  
14  $r^2$ 's and larger coefficients on the Standard Cable Coverage policy variable – than when the  
15 correct unweighted methodology is used, thus making the results appear better than they really  
16 are.

17

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59. These results are presented in Exhibit 3 hereto. As I had noted above, I was able to precisely reproduce Prof. Yoo's specifications (1), (3) and (4), but in the case of specification (2) the results I obtained were slightly different. For this comparison, I am using the results that I have been able to obtain for specification (2) for both the weighted and unweighted versions.

1 **Conclusion**

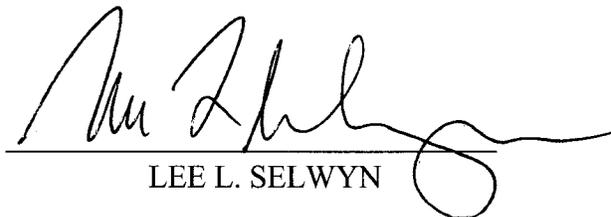
2

3 42. Prof. Yoo's regression analyses and the data upon which it relies are simply not  
4 capable of supporting the core conclusion that his paper advances – i.e., that US-style broadband  
5 regulation and its reliance upon facilities-based competitive entry, outperforms the European-  
6 style, common carrier approach under which incumbent providers are required to make  
7 components of their infrastructures available to entrants on a nondiscriminatory unbundled basis  
8 so that “service-based” competition can arise. The Yoo model is simply incapable of comparing  
9 US-style “facilities-based entry” regulation to European-style “service-based entry” regulation  
10 using the type of statistical analysis that his regression approach contemplates *because he has*  
11 *failed to include any instances of US-style regulation in the dataset underlying his regression*  
12 *model*. Beyond that fundamental – and fatal – flaw, the Yoo models also suffer from a range of  
13 other shortcomings, including misspecification of the principal “policy” variables that are being  
14 tested, omission of highly relevant and important explanatory variables, misapplication of the  
15 “panel model” methodology by failing to include entity-specific “dummy” variables, failing to  
16 control for other country-specific attributes including public subsidies and overall  
17 macroeconomic conditions, among other things. For almost any one of these individual reasons,  
18 and certainly for all of them when viewed together, Prof. Yoo's regression analyses and  
19 comparative data do not support any of the conclusions that he claims to have reached, and  
20 should be afforded no weight by the Commission in addressing and resolving the important legal  
21 and policy matters at issue in this proceeding.

1 VERIFICATION

2

3 The foregoing statements are true and correct to the best of my knowledge, information and  
4 belief, and if called to testify thereon I am prepared to do so.

  
LEE L. SELWYN

Executed at Boston, Massachusetts  
this 17th day of September, 2014.

**Exhibit 1**

**Regression Data  
Used in the Yoo Models**

Source: Provided by Prof. Yoo 8/20/14

Yoo DATA - Total Coverage

Country	Year	Rural	TotNGA	VDSL	FTTP	VDSL+FTTP	StdCable	DSLShare	NewEnt	RurPct	GDPPCPPS	PopTot
Austria	2012	0	0.695	0.505	0.063	0.568	0.356		0.127	0.143	130	8,451,860
Austria	2011	0	0.644	0.465	0.053	0.518	0.348		0.128	0.143	129	8,408,121
Belgium	2012	0	0.971	0.850	0.003	0.853	0.959		0.128	0.046	120	11,161,642
Belgium	2011	0	0.968	0.810	0.002	0.812	0.959		0.147	0.046	120	11,094,850
Bulgaria	2012	0	0.607	0.000	0.073	0.073	0.571		0.000	0.196	47	7,284,552
Bulgaria	2011	0	0.593	0.000	0.056	0.056	0.562		0.000	0.196	47	7,327,224
<b>Croatia</b>	2012	0	0.191	0.159	0.062	0.221	0.196			0.224	62	4,262,140
Croatia	2011	0								0.224	61	4,275,984
Cyprus	2012	0	0.731	0.520	0.000	0.520	0.474		0.197	0.125	92	865,878
Cyprus	2011	0	0.000	0.000	0.000	0.000	0.459		0.195	0.125	94	862,011
Czech Republic	2012	0	0.493	0.250	0.122	0.372	0.331		0.153	0.142	81	10,516,125
Czech Republic	2011	0	0.403	0.096	0.113	0.209	0.328		0.148	0.142	81	10,505,445
Denmark	2012	0	0.729	0.207	0.430	0.637	0.631		0.247	0.166	126	5,602,628
Denmark	2011	0	0.619	0.199	0.372	0.571	0.626		0.275	0.166	126	5,580,516
Estonia	2012	0	0.610	0.006	0.362	0.368	0.716		0.006	0.225	71	1,324,814
Estonia	2011	0	0.521	0.024	0.307	0.331	0.715		0.003	0.225	69	1,333,788
Finland	2012	0	0.655	0.450	0.333	0.783	0.420		0.000	0.181	115	5,426,674
Finland	2011	0	0.639	0.460	0.310	0.770	0.416		0.000	0.181	116	5,401,267
France	2012	0	0.242	0.000	0.065	0.065	0.255		0.561	0.175	109	65,633,194
France	2011	0	0.232	0.000	0.038	0.038	0.237		0.548	0.175	109	65,327,724
Germany	2012	0	0.662	0.463	0.026	0.489	0.591		0.467	0.105	123	80,523,746
Germany	2011	0	0.638	0.406	0.024	0.430	0.551		0.477	0.105	123	80,327,900
Greece	2012	0	0.219	0.217	0.004	0.221	0.000		0.565	0.199	75	11,062,508
Greece	2011	0	0.042	0.042	0.000	0.042	0.000		0.557	0.199	80	11,123,034
Hungary	2012	0	0.597	0.028	0.216	0.244	0.629		0.140	0.321	67	9,908,798
Hungary	2011	0	0.528	0.028	0.171	0.199	0.620		0.156	0.321	67	9,931,925
<b>Iceland</b>	2012	0	0.541	0.447	0.451	0.898	0.000			0.363	115	321,857
<b>Iceland</b>	2011	0	0.446	0.224	0.383	0.607	0.000			0.363	115	319,575
Ireland	2012	0	0.421	0.005	0.017	0.022	0.424		0.366	0.387	129	4,591,087
Ireland	2011	0	0.312	0.005	0.017	0.022	0.384		0.346	0.387	129	4,582,707
Italy	2012	0	0.140	0.045	0.118	0.163	0.000		0.467	0.127	101	59,685,227
Italy	2011	0	0.107	0.000	0.107	0.107	0.000		0.458	0.127	102	59,394,207

Latvia	2012	0	0.785	0.071	0.785	0.856	0.414	0.002	0.285	64	2,023,825
Latvia	2011	0	0.660	0.016	0.608	0.624	0.331	0.002	0.285	60	2,044,813
Lithuania	2012	0	0.800	0.000	0.800	0.800	0.530	0.007	0.346	72	2,971,905
Lithuania	2011	0	0.622	0.000	0.594	0.594	0.528	0.007	0.346	68	3,003,641
Luxembourg	2012	0	0.938	0.877	0.318	1.195	0.696	0.222	0.131	263	537,039
Luxembourg	2011	0	0.852	0.800	0.231	1.031	0.635	0.202	0.131	266	524,853
Malta	2012	0	0.999	0.750	0.009	0.759	0.999	0.005	0.009	86	421,364
Malta	2011	0	0.988	0.750	0.000	0.750	0.985	0.005	0.009	86	417,546
Netherlands	2012	0	0.984	0.599	0.177	0.776	0.988	0.266	0.082	128	16,779,575
Netherlands	2011	0	0.971	0.473	0.128	0.601	0.985	0.276	0.082	129	16,730,348
<b>Norway</b>	2012	0	0.757	0.327	0.296	0.623	0.461		0.218	195	5,051,275
<b>Norway</b>	2011	0	0.694	0.268	0.249	0.517	0.459	0.371	0.218	186	4,985,870
Poland	2012	0	0.445	0.257	0.029	0.286	0.324	0.360	0.207	67	38,533,299
Poland	2011	0	0.368	0.117	0.022	0.139	0.302	0.371	0.207	65	38,538,447
Portugal	2012	0	0.778	0.000	0.461	0.461	0.774	0.150	0.177	76	10,487,289
Portugal	2011	0	0.745	0.000	0.412	0.412	0.759	0.189	0.177	77	10,542,398
Romania	2012	0	0.637	0.174	0.547	0.721	0.264	0.000	0.209	50	20,020,074
Romania	2011	0	0.574	0.174	0.475	0.649	0.238	0.000	0.209	48	20,095,996
Slovakia	2012	0	0.511	0.003	0.394	0.397	0.283	0.146	0.148	76	5,410,836
Slovakia	2011	0	0.472	0.000	0.389	0.389	0.215	0.094	0.148	75	5,404,322
Slovenia	2012	0	0.651	0.429	0.427	0.856	0.362	0.370	0.256	84	2,058,821
Slovenia	2011	0	0.627	0.415	0.386	0.801	0.360	0.361	0.256	84	2,055,496
Spain	2012	0	0.639	0.109	0.179	0.288	0.513	0.409	0.177	96	46,704,308
Spain	2011	0	0.560	0.109	0.097	0.206	0.469	0.408	0.177	96	65,327,724
Sweden	2012	0	0.566	0.166	0.462	0.628	0.406	0.370	0.170	126	9,555,893
Sweden	2011	0	0.534	0.167	0.462	0.629	0.368	0.389	0.170	125	9,482,855
<b>Switzerland</b>	2012	0	0.942	0.534	0.167	0.701	0.950		0.146	158	8,039,060
<b>Switzerland</b>	2011	0	0.927	0.436	0.122	0.558	0.917		0.146	155	7,954,662
UK	2012	0	0.703	0.469	0.007	0.476	0.480	0.611	0.088	106	63,896,071
UK	2011	0	0.583	0.261	0.002	0.263	0.465	0.608	0.088	105	63,495,303

Yoo DATA - Rural Coverage

Country	Year	Rural	TotNGA	VDSL	FTTP	VDSL+FTTP	StdCable	DSLShare	NewEnt	RurPct	GDPPC	PPS	PopTot
Austria	2012	1	0.144	0.000	0.012	0.012	0.159		0.127	0.143	130		8,451,860
Austria	2011	1	0.087	0.000	0.000	0.000	0.111		0.128	0.143	129		8,408,121
Belgium	2012	1	0.654	0.586	0.000	0.586	0.591		0.128	0.046	120		11,161,642
Belgium	2011	1	0.654	0.559	0.000	0.559	0.589		0.147	0.046	120		11,094,850
Bulgaria	2012	1	0.000	0.000	0.000	0.000	0.000		0.000	0.196	47		7,284,552
Bulgaria	2011	1	0.001	0.000	0.001	0.001	0.000		0.000	0.196	47		7,327,224
Croatia	2012	1	0.000	0.000	0.000	0.000	0.000			0.224	62		4,262,140
Croatia	2011	1								0.224	61		4,275,984
Cyprus	2012	1	0.450	0.450	0.000	0.450	0.000		0.197	0.125	92		865,878
Cyprus	2011	1	0.000	0.000	0.000	0.000	0.000		0.195	0.125	94		862,011
Czech Republic	2012	1	0.015	0.000	0.013	0.013	0.011		0.153	0.142	81		10,516,125
Czech Republic	2011	1	0.000	0.000	0.000	0.000	0.000		0.148	0.142	81		10,505,445
Denmark	2012	1	0.030	0.000	0.030	0.030	0.000		0.247	0.166	126		5,602,628
Denmark	2011	1	0.000	0.000	0.000	0.000	0.000		0.275	0.166	126		5,580,516
Estonia	2012	1	0.000	0.000	0.000	0.000	0.251		0.006	0.225	71		1,324,814
Estonia	2011	1	0.014	0.014	0.000	0.014	0.137		0.003	0.225	69		1,333,788
Finland	2012	1	0.066	0.000	0.066	0.066	0.000		0.000	0.181	115		5,426,674
Finland	2011	1	0.042	0.000	0.000	0.000	0.000		0.000	0.181	116		5,401,267
France	2012	1	0.006	0.000	0.006	0.006	0.007		0.561	0.175	109		65,633,194
France	2011	1	0.000	0.000	0.000	0.000	0.000		0.548	0.175	109		65,327,724
Germany	2012	1	0.264	0.218	0.007	0.225	0.093		0.467	0.105	123		80,523,746
Germany	2011	1	0.215	0.131	0.004	0.135	0.072		0.477	0.105	123		80,327,900
Greece	2012	1	0.000	0.000	0.000	0.000	0.000		0.565	0.199	75		11,062,508
Greece	2011	1	0.000	0.000	0.000	0.000	0.000		0.557	0.199	80		11,123,034
Hungary	2012	1	0.101	0.000	0.035	0.035	0.161		0.140	0.321	67		9,908,798
Hungary	2011	1	0.039	0.000	0.034	0.034	0.144		0.156	0.321	67		9,931,925
Iceland	2012	1	0.000	0.000	0.000	0.000	0.000			0.363	115		321,857
<b>Iceland</b>	2011	1	0.000	0.000	0.000	0.000	0.000			0.363	115		319,575
Ireland	2012	1	0.014	0.000	0.000	0.000	0.014		0.366	0.387	129		4,591,087
Ireland	2011	1	0.000	0.000	0.000	0.000	0.014		0.346	0.387	129		4,582,707
Italy	2012	1	0.000	0.000	0.000	0.000	0.000		0.467	0.127	101		59,685,227
Italy	2011	1	0.000	0.000	0.000	0.000	0.000		0.458	0.127	102		59,394,207

Latvia	2012	1	0.244	0.000	0.244	0.244	0.000	0.002	0.285	64	2,023,825
Latvia	2011	1	0.074	0.000	0.074	0.074	0.000	0.002	0.285	60	2,044,813
Lithuania	2012	1	0.422	0.000	0.422	0.422	0.003	0.007	0.346	72	2,971,905
Lithuania	2011	1	0.221	0.000	0.221	0.221	0.003	0.007	0.346	68	3,003,641
Luxembourg	2012	1	0.913	0.825	0.242	1.067	0.000	0.222	0.131	263	537,039
Luxembourg	2011	1	0.841	0.753	0.176	0.929	0.000	0.202	0.131	266	524,853
Malta	2012	1	0.895	0.000	0.000	0.000	0.895	0.005	0.009	86	421,364
Malta	2011	1	0.029	0.000	0.000	0.000	0.029	0.005	0.009	86	417,546
Netherlands	2012	1	0.845	0.284	0.085	0.369	0.860	0.266	0.082	128	16,779,575
Netherlands	2011	1	0.729	0.278	0.085	0.363	0.829	0.276	0.082	129	16,730,348
Norway	2012	1	0.190	0.055	0.093	0.148	0.094		0.218	195	5,051,275
<b>Norway</b>	2011	1	0.205	0.022	0.050	0.072	0.082	0.371	0.218	186	4,985,870
Poland	2012	1	0.007	0.000	0.000	0.000	0.007	0.360	0.207	67	38,533,299
Poland	2011	1	0.006	0.000	0.000	0.000	0.006	0.371	0.207	65	38,538,447
Portugal	2012	1	0.318	0.000	0.060	0.060	0.308	0.150	0.177	76	10,487,289
Portugal	2011	1	0.307	0.000	0.051	0.051	0.301	0.189	0.177	77	10,542,398
Romania	2012	1	0.250	0.013	0.232	0.245	0.042	0.000	0.209	50	20,020,074
Romania	2011	1	0.216	0.013	0.200	0.213	0.040	0.000	0.209	48	20,095,996
Slovakia	2012	1	0.000	0.000	0.000	0.000	0.000	0.146	0.148	76	5,410,836
Slovakia	2011	1	0.000	0.000	0.000	0.000	0.000	0.094	0.148	75	5,404,322
Slovenia	2012	1	0.000	0.000	0.000	0.000	0.000	0.370	0.256	84	2,058,821
Slovenia	2011	1	0.000	0.000	0.000	0.000	0.000	0.361	0.256	84	2,055,496
Spain	2012	1	0.130	0.000	0.000	0.000	0.140	0.409	0.177	96	46,704,308
Spain	2011	1	0.066	0.000	0.000	0.000	0.075	0.408	0.177	96	65,327,724
Sweden	2012	1	0.063	0.002	0.062	0.064	0.001	0.370	0.170	126	9,555,893
Sweden	2011	1	0.049	0.002	0.047	0.049	0.001	0.389	0.170	125	9,482,855
Switzerland	2012	1	0.648	0.127	0.029	0.156	0.657		0.146	158	8,039,060
<b>Switzerland</b>	2011	1	0.412	0.069	0.000	0.069	0.644		0.146	155	7,954,662
UK	2012	1	0.182	0.143	0.001	0.144	0.050	0.611	0.088	106	63,896,071
UK	2011	1	0.038	0.038	0.000	0.038	0.000	0.608	0.088	105	63,495,303

## **Exhibit 2**

### **Yoo Model Specifications**

Source: Provided by Prof. Yoo 8/23/14

```
reg TotNGA DSLShareNewEnt RurPct GDPPCPPS Year [aweight = PopTot]
if Rural == 0, cluster(Country)
```

```
reg TotNGA StdCable RurPct GDPPCPPS Year [aweight = PopTot] if
Rural == 0, cluster(Country)
```

```
reg TotNGA DSLShareNewEnt StdCable RurPct GDPPCPPS Year [aweight
= PopTot] if Rural == 0, cluster(Country)
```

```
reg VDSLFTTP DSLShareNewEnt StdCable RurPct GDPPCPPS Year
[aweight = PopTot] if Rural == 0, cluster(Country)
```

## **Exhibit 3**

### **Replication of the Yoo models with and without country population weightings**

Table 1. Regression Results for Yoo Model (Weighted per Yoo Results)

Specification	(1)	(2)	(3)	(4)
Dependent Variable	TotNGA	TotNGA	TotNGA	VDSL+FTTP
Percent DSL by New Entrants	-0.809*** (0.247)		-0.244 (0.167)	-0.770*** (0.219)
Standard Cable Coverage		0.893*** (0.0667)	0.818*** (0.0931)	0.288** (0.115)
Percentage rural households	-1.477* (0.792)	-0.333 (0.319)	-0.655* (0.367)	-1.283** (0.473)
GDP per capita	0.00271* (0.00147)	-0.000749 (0.00112)	-0.000435 (0.000977)	0.00189 (0.00137)
Year	0.0496*** (0.0131)	0.0354** (0.0145)	0.0355** (0.0146)	0.0842*** (0.0211)
Constant	0.757*** (0.237)	0.254* (0.134)	0.398** (0.147)	0.482* (0.248)
Observations	55	61	55	55
Adjusted R-squared	0.334	0.843	0.864	0.620
F-Statistic	30.76	72.28	42.82	82.95
RMSE	0.192	0.0948	0.0866	0.137

Note 1: Clustered standard errors are displayed in parenthesis.

Note 2: I was unable to exactly re-produce Yoo's 2nd Specification, however, the results are relatively similar.

Significance levels: \*  $p < 0.10$ ; \*\*  $p < 0.05$ ; \*\*\*  $p < 0.01$

Source: Yoo Data.

Table 2. Regression Results for Yoo Model (Unweighted)

Specification	(1)	(2)	(3)	(4)
Dependent Variable	TotNGA	TotNGA	TotNGA	VDSL+FTTP
Percent DSL by New Entrants	-0.703*** (0.185)		-0.326** (0.132)	-0.736*** (0.236)
Standard Cable Coverage		0.692*** (0.0919)	0.599*** (0.0855)	0.119 (0.137)
Percentage rural households	-0.773** (0.352)	0.125 (0.369)	-0.200 (0.296)	-0.453 (0.672)
GDP per capita	0.00194*** (0.000487)	0.000918** (0.000420)	0.00108*** (0.000295)	0.00332*** (0.000667)
Year	0.0850*** (0.0277)	0.0651** (0.0258)	0.0727** (0.0276)	0.0987*** (0.0224)
Constant	0.663*** (0.107)	0.115 (0.116)	0.272** (0.112)	0.280 (0.227)
Observations	55	61	55	55
Adjusted R-squared	0.416	0.651	0.697	0.435
F-Statistic	12.02	25.18	41.16	17.79
RMSE	0.182	0.143	0.132	0.220

Note 1: Clustered standard errors are displayed in parenthesis.

Significance levels: \* p<0.10; \*\* p<0.05; \*\*\* p<0.01

Source: Yoo Data.

**Attachment 1**

**STATEMENT OF QUALIFICATIONS**

**LEE L. SELWYN**

## Statement of Qualifications

### LEE L. SELWYN

Dr. Lee L. Selwyn has been actively involved in the telecommunications field for more than forty years, and is an internationally recognized authority on telecommunications regulation, economics and public policy. Dr. Selwyn founded the firm of Economics and Technology, Inc. in 1972, and has served as its President since that date. He received his Ph.D. degree from the Alfred P. Sloan School of Management at the Massachusetts Institute of Technology. He also holds a Master of Science degree in Industrial Management from MIT and a Bachelor of Arts degree with honors in Economics from Queens College of the City University of New York.

Dr. Selwyn has testified as an expert on rate design, service cost analysis, form of regulation, and other telecommunications policy issues in telecommunications regulatory proceedings before some forty state commissions, the Federal Communications Commission and the Canadian Radio-television and Telecommunications Commission, among others. He has appeared as a witness on behalf of commercial organizations, non-profit institutions, as well as local, state and federal government authorities responsible for telecommunications regulation and consumer advocacy.

He has served or is now serving as a consultant to numerous state utilities commissions including those in Arizona, Minnesota, Kansas, Kentucky, the District of Columbia, Connecticut, California, Delaware, Maine, Massachusetts, New Hampshire, Vermont, New Mexico, Wisconsin and Washington State, the Office of Telecommunications Policy (Executive Office of the President), the National Telecommunications and Information Administration, the Federal Communications Commission, the Canadian Radio-television and Telecommunications Commission, the United Kingdom Office of Telecommunications, and the Secretaria de Comunicaciones y Transportes of the Republic of Mexico. He has also served as an advisor on telecommunications regulatory matters to the International Communications Association and the Ad Hoc Telecommunications Users Committee, as well as to a number of major corporate telecommunications users, information services providers, competitive local exchange carriers, interexchange carriers, wireless services providers, and specialized access services carriers.

Dr. Selwyn has presented testimony as an invited witness before the U.S. House of Representatives Subcommittee on Telecommunications, Consumer Protection and Finance and before the U.S. Senate Judiciary Committee, on subjects dealing with restructuring and deregulation of portions of the telecommunications industry.

In 1970, he was awarded a Post-Doctoral Research Grant in Public Utility Economics under a program sponsored by the American Telephone and Telegraph Company, to conduct research on the economic effects of telephone rate structures upon the computer time sharing industry. This work was conducted at Harvard University's Program on Technology and Society, where he was appointed as a Research Associate. Dr. Selwyn was also a member of the faculty at the College of Business Administration at Boston University from 1968 until 1973, where he taught courses in economics, finance and management information systems.

*Statement of Qualifications – Lee L. Selwyn*

Dr. Selwyn has been an invited speaker at numerous seminars and conferences on telecommunications regulation and policy, including meetings and workshops sponsored by the National Telecommunications and Information Administration, the National Association of Regulatory Utility Commissioners, the U.S. General Services Administration, the Institute of Public Utilities at Michigan State University, the National Regulatory Research Institute, the Harvard University Program on Information Resources Policy, the Columbia University Institute for Tele-Information, the Massachusetts Institute of Technology Alfred P. Sloan School of Management, the National Association of State Utility Consumer Advocates (NASUCA), the National Conference of Regulatory Attorneys, as well as at numerous conferences and workshops sponsored by individual regulatory agencies. Dr. Selwyn is an elected Town Meeting Member for the Town of Brookline, Massachusetts, and serves on the Town's Advisory and Finance Committee and its Subcommittee on Planning and Regulation, on the Town's Audit Committee, and on its Tax Override Study Committee.

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## RECORD OF EXPERT TESTIMONY

### DR. LEE L. SELWYN

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**Governor in Council, Dominion of Canada**, *Petition to the Governor in Council – Bell Canada and Bell Aliant and TELUS Communications Company*, Application to review and vary certain determination concerning Telecom Decision CRTC 2008-117 and to rescind Telecom Order CRTC 2009-111, on behalf of MTS Allstream, Inc., Reports in support of Responses filed March 11, 2009 and May 4, 2009.

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**Federal Communications Commission**, *High-Cost Universal Service Support, Federal-State Joint Board on Universal Service, and other combined dockets*, WC Docket No. 05-337, CC Docket 96-45 and others, on behalf of Broadview Networks, Cavalier Communications, Nuvox, Inc., Pac-West Telecomm, Inc., tw telecom inc., XO Communications, Declaration filed November 26, 2008.

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**Federal Communications Commission**, *Petition of AT&T Inc. For Interim Declaratory Ruling and Limited Waivers, Developing a Unified Intercarrier Compensation Regime, Intercarrier Compensation for ISP-Bound Traffic*, WC Docket No. 08-152, CC Docket No. 01-92, WC Docket No. 99-68, on behalf Pac-West Telecomm, Inc., Declaration filed August 21, 2008.

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**Federal Communications Commission**, *CTIA Petition for Expedited Declaratory Ruling on Early Termination Fees*, WT Docket No. 05-194, Oral and Written Statements at *en banc* hearing, June 12, 2008.

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**Industry Canada, Telecommunications Policy Branch**, Notice DGTP-002-07: *Consultation on a Framework to Auction Spectrum on the 2GHz Range including Advanced Wireless Services*, Appendix B – *Comparison of Wireless Service Price Levels in the US and Canada* – to Comments of MTS Allstream Inc., filed May 25, 2007; Appendix A – *The AWS Spectrum Auction: a One-time Opportunity to Introduce Real Competition or Wireless Services in Canada* – to Reply Comments of MTS Allstream Inc., filed June 27, 2007.

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**Telecommunications Regulatory Board of Puerto Rico**, *Telefónica Larga Distancia de Puerto Rico, Inc., Petition for arbitration pursuant to Section 47 U.S.C. 252 (b) of the Federal Communications Act and Section 5 (b), Chapter III, of the Puerto Rico Telecommunications Act, regarding interconnection rates, terms and conditions with Puerto Rico Telephone Company, Inc.*, Docket No. JRT-2006-AR-0001, on behalf of Telefónica Larga Distancia de Puerto Rico, Inc., Direct Testimony filed January 16, 2007, Reply Testimony filed February 7, 2007, cross-examination February 14, 2007, Declaration filed March 30, 2007.

**American Arbitration Association Class Action Arbitration Tribunal**, *Patricia Brown and Harold P. Schroer on an individual basis, and also on a classwide basis on behalf of other similarly situated, Claimant, against Celco Partnership d/b/a Verizon Wireless, Respondent*, Case No. 11 494 01274 05, on behalf of Plaintiffs, oral testimony January 25, 2007, Rebuttal Report filed March 1, 2007

**Industry Canada, Competition Bureau**, *Competition Bureau's Draft Information Bulletin on the abuse of Dominance provisions as Applied to the Telecommunications Industry*, Appendix A – *Preventing Abuse of Dominance in Canadian Telecom Markets* – to Comments of MTS Allstream Inc., filed January 12, 2007.

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**Superior Court of the State of California, County of Alameda**, *Cell Phone Termination Fee Cases, Re: Zill et al. v. Sprint Spectrum Limited Partnership, et al.* Judicial Council Coordination Proceeding No. 4332, on behalf of Bramson, Plutzik, Mahler & Birkhaeuser, LLP; Lerach, Coughlin, Stoia Geller Rudman & Robbins; and Franklin & Franklin, Declaration filed November 9, 2006, Declaration filed December 19, 2006, Rebuttal Declaration filed December 19, 2006, *all under seal*.

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**Federal Communications Commission, *CTIA Petition for Expedited Declaratory Ruling on Early Termination Fees***, WT Docket No. 05-194, on behalf of AARP, Declaration filed September 8, 2006.

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**Illinois Commerce Commission, *Annual Rate Filing for Non-Competitive Services Under an Alternative Form of Regulation***, Docket No. 06-0269, on behalf of the People of the State of Illinois, Declaration filed May 5, 2006.

**Illinois Commerce Commission, *Illinois Commerce Commission vs. Illinois Bell Telephone Company, Investigation of Specified Tariffs Declaring Certain Services to be Competitive Telecommunications Services***, Docket No. 06-0027, on behalf of the People of the State of Illinois, the City of Chicago, the Cook County State's Attorney's Office, and AARP, Supplemental Testimony filed May 24, 2006, cross-examination April 5, 2006.

**Illinois Commerce Commission, *Illinois Commerce Commission vs. Illinois Bell Telephone Company, Investigation of Specified Tariffs Declaring Certain Services to be Competitive Telecommunications Services***, Docket No. 06-0027, on behalf of the People of the State of Illinois, Direct Testimony filed March 6, 2006, Rebuttal Testimony filed March 24, 2006, cross-examination April 5, 2006.

## **2005**

**Superior Court of California, County of Alameda, *Bay Area Cellular Telephone Company, doing business as AT&T Wireless Services; GTE Mobilnet of California Limited Partnership, doing business as Verizon Wireless;; Cingular Wireless LLC; Silvano Mendoza; and Walid Achikxai, Plaintiffs, v. City of Union City, and DOES 1 through 100, Defendants***, Case No: HG04-161366, Declaration filed November 8, 2005.

**California Public Utilities Commission, *Joint Application of Verizon Communications Inc. ("Verizon") and MCI, Inc. ("MCI") to Transfer Control of MCI's California Utility Subsidiaries to Verizon, Which Will Occur Indirectly as a Result of Verizon's Acquisition of MCI***, Application No. 05-04-020, on behalf of the Office of Ratepayer Advocates, Reply Testimony filed August 15, 2005.

**California Public Utilities Commission, *Joint Application of SBC Communications Inc. ("SBC") and AT&T Corp. ("AT&T") for Authorization to Transfer Control of AT&T Communications of California (U-5002), TCG Los Angeles, Inc. (U-5462), TCG San Diego (U-5389) and TCG San Francisco (U-5454) to SBC, Which Will Occur Indirectly as a Result of AT&T's Merger with SBC, Tau Merger Sub Corporation***, Application No. 05-02-027, on behalf of the Office of Ratepayer Advocates, Reply Testimony filed June 24, 2005.

**Federal Communications Commission, AT&T Corp. And SBC Communications Inc. Application Pursuant to Section 214 of the Communications Act of 1934 and Section 63.04 of the Commission's Rules for Consent to the Transfer of Control of AT&T Corp. To SBC Communications Inc.,** WC Docket No. 05-65, on behalf of CompTel/ALTS, Reply Declaration filed May 10, 2005.

**2004**

**United States District Court for the District of Colorado, Qwest Corporation, a Colorado corporation, Plaintiff, v. AT&T Corp., a New York corporation, and AT&T Communications, Inc., a Delaware corporation, Defendants,** Civil Action No. 03-F-2084 (CBS), Export Report of Dr. Lee L. Selwyn, filed November 30, 2004.

**Washington Utilities and Transportation Commission, Washington and Utilities and Transportation Commission, Complainant v. Verizon Northwest, Inc., Respondent,** Docket No. UT-040788, on behalf of the Washington Utilities and Transportation Commission Staff, Direct Testimony filed November 22, 2004.

**Federal-State Joint Board on Universal Service, En Banc Hearing on High-Cost Universal Service Support in Areas Served by Rural Carriers,** CC Docket No. 96-45, on behalf of Western Wireless Corp, November 17, 2004.

**New Mexico Public Regulation Commission, Investigation of Whether Qwest Corporation is in Compliance with the Investment Requirements of its Amended Alternative Form of Regulation Plan,** Docket No. 04-00237-UT, on behalf of the New Mexico Public Regulation Commission Staff, Direct Testimony filed October 22, 2004.

**Federal Communications Commission, Unbundled Access to Network Elements, Review of the Section 251; Unbundling Obligations of the Incumbent Local Exchange Carriers,** WC Docket No. 04-313 and CC Docket No. 01-338, on behalf of AT&T Corp., Declaration filed October 4, 2004, Reply Declaration filed October 19, 2004, *Ex Parte* Declaration filed November 8, 2004.

**Federal Communications Commission, Petition of Qwest Corporation for Forbearance Pursuant to 47 U.S.C. § 160(c) in the Omaha Metropolitan Statistical Area,** WC Docket No. 04-223, on behalf of AT&T Corp., Declaration filed August 24, 2004.

**Wisconsin Public Service Commission, Petition of Wisconsin Bell, Inc., d/b/a SBC Wisconsin, to Establish Rates and Costs for Unbundled Network Elements,** Docket No. 6720-T1-187, on behalf of AT&T Communications of Wisconsin, L.P. and TCG Milwaukee, Rebuttal Testimony filed June 15, 2004, cross-examination July 30, 2004.

**Federal Communications Commission, Section 272(f)(1) Sunset of the BOC Separate Affiliate and Related Requirements; 2000 Biennial Regulatory Review Separate Affiliate Requirements of Section 64.1903 of the Commission's Rules,** on behalf of AT&T Corp., *Ex Parte* Declaration filed June 8, 2004.

**Ohio Public Utilities Commission, Review of SBC Ohio's TELRIC Costs for Unbundled Network Elements,** Docket No. 02-1280-TP-UNC, on behalf of AT&T Communications of Ohio, Inc., TCG Ohio, LDMI Telecommunications, Inc., CoreComm Newco, Inc., and XO Ohio Inc., Direct Testimony filed May 28, 2004.

**Washington Utilities and Transportation Commission, Review of: Unbundled Loop and Switching Rates; the Deaveraged Zone Rate Structure; and Unbundled Network Elements, Transport, and Termination (Recurring Costs),** Docket No. UT-023003, on behalf of AT&T Communications of the Pacific Northwest, Inc., Direct Testimony filed April 20, 2004, Surrebuttal Testimony filed May 12, 2004, Affidavit filed June 1, 2004.

**Arizona Corporation Commission, Qwest Corporation's Filing Amended Renewed Price Regulation Plan; Investigation of the Cost of Telecommunications Access,** Docket No. T-01501B-03-0454 and Docket No. T-00000D-00-0672, on behalf of AT&T Communications of the Mountain States, Inc., Affidavit filed April 8, 2004.

**Iowa Department of Commerce Utilities Board**, *Implementation of the Federal Communications Commission's Triennial Review Order Adopting New Rules For Network Unbundling Obligations*, Docket No. INU-03-1, on behalf of AT&T Communications of the Midwest, Inc., and TCG Omaha, Inc., (Collectively "AT&T"), Direct Testimony (with William H. Lehr) filed February 25, 2004.

**Illinois Commerce Commission**, *Illinois Bell Telephone Company Filing to Increase Unbundled Loop and Nonrecurring Rates*, ICC Docket No. 02-0864, on behalf of AT&T Communications of Illinois, Inc., Direct Testimony filed February 20, 2004, Rebuttal Testimony filed February 20, 2004.

**United States Court of Appeals for the District of Columbia Circuit**, *Verizon Virginia, Inc., Petitioner v. Federal Communications Commission and United States of America, Respondents*, No. 04-1043 on behalf of AT&T Communications of Virginia, LLC ("AT&T") and WorldCom, Inc. ("MCI"), Declaration filed February 17, 2004.

**Oregon Public Utility Commission**, *Investigation to Determine, Pursuant to Order of the Federal Communications Commission, Whether Impairment Exists in Particular Markets if Local Circuit Switching for Mass Market Customers is No Longer Available as an Unbundled Network Element*, UM 1100, on behalf of AT&T Communications of the Pacific Northwest, Inc., AT&T Local Services on behalf of TCG Oregon (Collectively "AT&T"), Direct Testimony (with William H. Lehr) filed February 17, 2004.

**New Mexico Public Regulations Commission**, *Staff's Petition for Issuance of a Notice of Inquiry into State Implementation of the FCC's Triennial Review of Its Rules Concerning ILECs' Network Unbundling Obligations*, Case No. 03-00201-UT, on behalf of AT&T Communications of the Mountain States, Inc., Direct Testimony (with William H. Lehr) filed February 16, 2004.

**Colorado Public Utilities Commission**, *Implementation of the Federal Communications Commission's Triennial Review Order Adopting New Rules for Network Unbundling Obligations*, Docket No. 031-478T, on behalf of AT&T Communications of the Mountain States and TCG Colorado, Direct Testimony (with William H. Lehr) filed January 26, 2004.

**Minnesota Public Utilities Commission**, *Commission Investigation into ILEC Unbundling Obligations as a Result of the Federal Triennial Review Order*, Docket Nos. MPUC P-999/CI-3-961, OAH 12-2500-15571-2, on behalf of AT&T Communications of the Midwest, Inc. and TCG Minnesota, Inc., Direct Testimony (with William H. Lehr) filed January 23, 2004.

**Michigan Public Service Commission**, *Commission's own motion, to review the costs of telecommunications services provided by SBC Michigan*, Case No. U-13531, on behalf of AT&T Communications of Michigan, Inc., Initial Testimony filed January 20, 2004; Reply Testimony filed May 10, 2004.

**Utah Public Service Commission**, *Proceeding to Address Actions Necessary to Respond to the Federal Communications Commission Triennial Review Order Released August 21, 2003*, Docket No. 03-999-04, on behalf of AT&T Communications of the Mountain states, Inc., and TCG Utah, Direct Testimony (with William H. Lehr) filed January 13, 2004.

**Arizona Corporation Commission**, *ILEC Unbundling Obligations as a Result of the Federal Triennial Review Order*, Docket No. T-00000A-03-0369, on behalf of AT&T Communications of the Mountain States, Inc., and TCG Phoenix, Direct Testimony (with William H. Lehr) filed January 9, 2004.

2003

**Washington Utilities and Transportation Commission**, *Petition of QWEST CORPORATION To Initiate a Mass-Market Switching And Dedicated Transport Case Pursuant to the Triennial Review Order*, Docket No. UT-033044, on behalf of AT&T Communications of the Pacific Northwest, Inc., AT&T Local Services on behalf of TCG Seattle, and TCG Oregon (Collectively “AT&T”), Direct Testimony (with William H. Lehr) filed December 22, 2003, Response Testimony filed February 2, 2004, Rebuttal Testimony filed February 20, 2004.

**Federal Communications Commission**, *Review of the Commission’s Rules Regarding the Pricing of Unbundled Network Elements and the Resale of Service by Incumbent Local Exchange Carriers*, WC Docket No. 03-173, on behalf of AT&T Corp., Declaration filed December 16, 2003, Reply Declaration filed January 30, 2004.

**Federal Communications Commission**, *Section 272(b)(1)’s “Operate Independently” Requirement for Section 272 Affiliates*, WC Docket 03-228, on behalf of AT&T Corp., Declaration filed December 10, 2003.

**California Public Utilities Commission**, *Order Instituting Rulemaking to Review Policies Concerning Intrastate Carrier Access Charges*, Docket No. R.03-08-018, on behalf of AT&T Communications of California, Inc. , Declaration filed November 12, 2003.

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**New Jersey Board of Public Utilities**, *AT&T Communications of NJ, P.P., v. Verizon New Jersey, Inc., Verizon Long Distance, Inc., Verizon Enterprise Solutions, Inc., Verizon Global Networks, Inc., and Verizon Select Services, Inc.*, Docket TR 03100767, on behalf of AT&T Communications of NJ, P.L., Affidavit filed October 1, 2003.

**Utah Public Service Commission**, *Petition of Qwest Corporation for Pricing Flexibility for Residence Services in the Areas Served by 19 Central Offices*, Docket No. 03-049-49, on behalf of the Utah Committee of Consumer Services, Direct Testimony filed September 29, 2003, cross-examination October 28, 2003.

**Utah Public Service Commission**, *Petition of Qwest Corporation for Pricing Flexibility for Business Services in the Areas Served by 19 Central Offices*, Docket No. 03-049-50, on behalf of the Utah Committee of Consumer Services, Direct Testimony filed September 29, 2003, cross-examination October 28, 2003.

**United States Court of Appeals for the Eighth Circuit**, *Eschelon Telecom, Inc. v. Federal Communications Commission and United States of America*, Docket No. 03-3212 (and consolidated cases), on behalf of AT&T Corp., Declaration filed September 23, 2003.

**Superior Court of the State of Washington in and for the County of Snohomish**, *Verizon Northwest, Inc., v. Washington Utilities and Transportation Commission*, on behalf of AT&T of the Pacific Northwest, Inc., Affidavit filed September 2, 2003.

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**Federal Communications Commission**, *Petition for Forbearance From The Prohibition of Sharing Operating, Installation, and Maintenance Functions Under Section 53.203(a)(2) Of The Commission’s Rules*, CC Docket No. 96-149, on behalf of AT&T Corp., *Ex Parte* Declaration filed July 9, 2003.

**Federal Communications Commission**, *Section 272(f)(1) Sunset of the BOC Separate Affiliate and Related Requirements*, WC Docket No. 02-112, *2000 Biennial Regulatory Review Separate Affiliate Requirements of Section 64.1903 of the Commission's Rules*, CC Docket No. 00-175, on behalf of AT&T Corp., Declaration filed June 30, 2003, Reply Declaration filed July 28, 2003, *Ex parte* Declaration June 8, 2004.

**Federal Communications Commission**, *Improving Public Safety Communications in the 800 MHz Band Consolidating the 900 MHz Industrial/Land Transportation and Business Pool Channels*, WT Docket No. 02-55, on behalf of James A. Kay, Jr., *Ex Parte* presentation and report *Market-based Solutions for Realigning Spectrum Use in the 800 MHz Band*, *Ex Parte* filed (with Helen Golding) June 25, 2003.

**United States District Court For The Northern District of Illinois**, *Voices for Choices, AT&T Communications of Illinois, Inc., MCI Metro Access Transmission Services, LLC, and Association of Local Telecommunications Services*, Plaintiffs, v. *Illinois Bell Telephone Co. Inc. d/b/a SBC Illinois, Ameritech Corp. d/b/a SBC Midwest, and Edward C. Hurley, Erin M. O'Connell-Diaz, Lula M. Ford, Mary Frances Squires, and Kevin K. Wright, in their capacities as Commissioners of the Illinois Commerce Commission and Not as Individuals*, Defendants, No. 03 C 3290, Hon. Charles P. Kocoras, on behalf of AT&T, Affidavit filed May 30, 2003.

**Washington Utilities and Transportation Commission**, *Application of Qwest Corporation Regarding the Sale and Transfer of Qwest Dex to Dex Holdings, LLC, a non-affiliate*, Docket No. UT-021120, on behalf of the Washington Utilities and Transportation Commission Staff, Direct Testimony Filed March 18, 2003, cross-examination May 19-23, 2003.

**Virginia State Corporation Commission**, *AT&T Communications of Virginia, L.L.C., Complainant v. Verizon Virginia, Inc., Verizon South, Inc., Verizon Long Distance Virginia, Inc., Verizon Enterprise Solutions Virginia, Inc., Verizon Global Networks, Inc., and Verizon Select Services of Virginia, Inc.*, Case No. PUC-2003-00091, on behalf of AT&T Communications of Virginia, L.L.C., Affidavit filed May 6, 2003.

**Washington Utilities and Transportation Commission**, *Verizon Northwest Inc., Advice Letter No. 3076*, Docket No. UT-030395, on behalf of the AT&T Communications of the Pacific Northwest, Inc., Affidavit filed April 14, 2003.

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**Federal Communications Commission**, *Petition for Forbearance From The Prohibition of Sharing Operating, Installation, and Maintenance Functions Under Section 53.203(a)(2) Of The Commission's Rules*, CC Docket No. 96-149, on behalf of AT&T Corp., *Ex Parte* Declaration filed November 15, 2002.

**Minnesota Public Utilities Commission, Office of Administrative Hearings**, *Complaint of the Minnesota Department of Commerce Against Qwest Corporation Regarding Unfiled Agreements*, PUC Docket No. P-421/CI-02-197, on behalf of the Minnesota Department of Commerce, Affidavit filed November 8, 2002.

**Maine Public Utilities Commission**, *Petition for Global NAPs, Inc. For Arbitration Pursuant to 47 U.S.C. §252(b) of the Telecommunications Act of 1996 to Establish and Interconnection Agreement with Verizon Maine, Inc. f/k/a Bell Atlantic-Maine*, Docket No. 2002-421, on behalf of Global NAPs, Inc., Direct Testimony filed October 30, 2002.

**Federal Communications Commission**, *Qwest Communications International, Inc. Consolidated Application for Authority to Provide In-Region, InterLATA Services in Colorado, Idaho, Iowa, Montana, Nebraska, North Dakota, Utah, Washington, and Wyoming*, WC Docket No. 02-314, filed on behalf of AT&T Corp., Declaration filed October 15, 2002.

**District of Columbia Public Service Commission**, *Verizon Washington, D.C., Inc.'s Compliance With the Conditions Established in Section 271 of the Federal Telecommunications Act of 1996*, Case No. 1011, on behalf of the Office of People's Counsel of the District of Columbia, Affidavit filed September 30, 2002, Supplemental Affidavit filed November 8, 2002.

**Washington Utilities and Transportation Commission**, *AT&T Communications of the Pacific Northwest v. Verizon Northwest, Inc.*, Docket No. UT-020406, on behalf of AT&T Communications of the Pacific Northwest, Inc., Direct Testimony filed September 30, 2002, Rebuttal Testimony filed January 31, 2003, Revisions dated May 1, 2003, Settlement Conference March 4-5, 2003, Surrebuttal Testimony filed March 6, 2003.

**Florida Public Service Commission**, *Global NAPs, Inc. Petition for Arbitration Pursuant to 47 U.S.C. Section 252(b) of Interconnection Rates, Terms and Conditions with ALLTEL Florida, Inc.*, on behalf of Global NAPs, Inc., Docket No. 011354-TP, Direct Testimony filed September 27, 2002, Reply Testimony filed October 21, 2002, deposition January 13, 2003.

**New Hampshire Public Utilities Commission**, *Petition of Global NAPs, Inc. For Arbitration Pursuant to 47 U.S.C. §252(b) of the Telecommunications Act of 1996 to Establish an Interconnection Agreement with Verizon New Hampshire, Inc. f/k/a Bell Atlantic - New Hampshire*, Docket No. 02-107, on behalf of Global NAPs, Inc., Direct Testimony filed September 17, 2002, Reply Testimony filed September 23, 2002, cross-examination October 11, 2002.

**Massachusetts Department of Telecommunications and Energy**, *Global NAPs, Inc. Petition for Arbitration Pursuant to Section 252(b) of the Telecommunications Act of 1996 to Establish an Interconnection Agreement with Verizon New England Inc. d/b/a Verizon Massachusetts f/k/a New England Telephone and Telegraph Company. d/b/a Bell Atlantic*, D.T.E. 02-45 on behalf of Global NAPs, Inc., Direct Testimony filed September 10, 2002, cross-examination October 9, 2002.

**Pennsylvania Senate Communications and High Technology Committee**, *Hearing on Chapter 30 and the Telecommunications Industry in Pennsylvania*, on behalf of AT&T, Testimony filed September 10, 2002.

**Federal Communications Commission**, *Section 272(f)(1) Sunset of the BOC Separate Affiliate and Related Requirements*, WC Docket No. 02-112, on behalf of AT&T Corp., Declaration filed August 5, 2002, Reply Declaration filed August 26, 2002.

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**Federal Communications Commission**, *Application by Verizon New England, Inc., Bell Atlantic Communications, Inc. (d/b/a Verizon Long Distance), NYNEX Long Distance Company (d/b/a Verizon Enterprise Solutions), Verizon Global Networks, Inc., and Verizon Select Services (collectively, "Verizon") for Authorization to Provide In-Region, InterLATA Services in the States of Delaware and New Hampshire*, CC Docket No. 02-157, on behalf of AT&T Corp., Reply Declaration filed August 12, 2002.

**Maryland Public Service Commission**, *Review by the Commission Into Verizon Maryland's Compliance with the Conditions of U.S.C. §271(c)*, Case No. 8921 on behalf of the Maryland People's Counsel, Direct Testimony filed July 29, 2002, cross-examination October 31, 2002.

**California Public Utilities Commission**, *Verizon-California, Inc. (U1002) Petition for Arbitration of an Interconnection Agreement with Pac-West Telecomm, Inc. (U5266C) pursuant to Section (252(b) of the Telecommunications Act of 1996*, Application No. 02-06-024, on behalf of Pac-West Telecomm, Inc., Direct Testimony filed July 8, 2002.

**Federal Communications Commission**, *Notice of Inquiry Concerning a Review of the Equal Access and Nondiscrimination Obligations Applicable to Local Exchange Carriers*, CC Docket No. 02-39, on behalf of AT&T Corp., Declaration filed May 10, 2002.

**Florida Public Service Commission**, *Petition by Global NAPs, Inc. for arbitration pursuant to 47 U.S.C. §252(b) of interconnection rates, terms and conditions with Verizon Florida, Inc.*, Docket No. 011666-TP, on behalf of Global NAPs, Inc., Direct Testimony filed on May 8, 2002, Rebuttal Testimony filed January 16, 2003.

**Virginia State Corporation Commission**, *Inquiry into Verizon Virginia Inc.'s Compliance with the Conditions Set Forth in 47 U.S.C. § 271(c)*, Case No. PUC-2002-0046, on behalf of AT&T Corp., Declaration filed May 3, 2002.

**Minnesota Public Utilities Commission, Office of Administrative Hearings**, *Commission Investigation into Qwest's Compliance with Section 271(d)(3)(c) of the Telecommunications Act of 1996 that the Requested Authorization is Consistent with the Public Interest, Convenience and Necessity*, Docket No. P-421/CI-01-1373, OAH Docket No. 7-2500-24487-2, Affidavit on behalf of the Minnesota Department of Commerce filed May 3, 2002, cross-examination June 3, 2002, Surrebuttal Affidavit filed June 17, 2002.

**California Public Utilities Commission**, *Petition by Pac-West Telecomm, Inc. for Arbitration of an Interconnection Agreement with Pacific Bell Pursuant to Section 252(b) of the Telecommunications Act of 1996*, Application No. 02-03-059 on behalf of Pac-West Telecomm, Inc., Direct Testimony filed April 23, 2002, cross-examination May 30, 2002.

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**Georgia Public Service Commission**, *Global NAPs, Inc. Petition for Arbitration Pursuant to 47 U.S.C. Section 252(b) of Interconnection Rates, Terms and Conditions with ALLTEL Georgia, Inc.; ALLTEL Georgia Communications Corp.; Georgia ALLTEL Telecom, Inc.; Georgia Telephone Corp.; and Standard Telephone Company*, Docket No. 14529-U, on behalf of Global NAPs, Inc., Direct Testimony filed March 11, 2002, Rebuttal Testimony filed April 8, 2002.

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**Florida Public Service Commission**, *Investigation into appropriate methods to compensate carriers for exchange of traffic subject to Section 251 of the Telecommunications Act of 1996*, Docket No. 000075-TP, on behalf of AT&T Communications of the Southern States, Inc., TCG of South Florida, Global NAPS, Inc., MediaOne Florida Telecommunications, Inc., Time Warner Telecom of Florida, L.P., Allegiance Telecom of Florida, Inc., Florida Cable Telecommunications Association, Inc. and the Florida Competitive Carriers Association, Direct Testimony filed December 1, 2000, Rebuttal Testimony filed January 10, 2001.

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**New Jersey Board of Public Utilities**, *Application of Bell Atlantic-New Jersey, Inc. for Approval of a Modified Plan for an Alternative Form of Regulation and to Reclassify All Rate Regulated Services as Competitive Services*, Docket No. TO99120934, on behalf of the State of New Jersey Division of the Ratepayer Advocate, Direct Testimony filed August 8, 2000, Supplemental Direct Testimony filed August 18, 2000, Rebuttal Testimony September 8, 2000, cross-examination waived October 26, 2000.

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**High Court of Dublin Ireland**, *Orange Communications Ltd, plaintiff, v. Director of Telecommunications Regulation and Meteor Mobile Communications, Limited, Defendants*, 1998 No. 12160P, Appearance before the Court, July 26, 1999.

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**Illinois Commerce Commission, SBC Communications, Inc., SBC Delaware, Inc., Ameritech Corporation, Illinois Bell Telephone Company d/b/a Ameritech Illinois metro, Inc., Joint Application for Approval of the Reorganization of Illinois Bell Telephone Company d/b/a Ameritech Illinois, and the Reorganization of Ameritech Illinois Metro, Inc. in Accordance with Section 7-204 of The Public Utilities Act and For All Other Appropriate Relief**, Docket No. 98-0555, on behalf of Government and Consumer Intervenors (GCI); the Citizens Utility Board, The Cook County State's Attorney, and the Attorney General of the State of Illinois, Direct Testimony filed October 28, 1998, Rebuttal Testimony filed December 18, 1998, Direct Testimony on re-opening July 6, 1999.

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**Rhode Island Public Utilities Commission, Bell Atlantic's TELRIC Study**, Docket No. 2681, on behalf of AT&T Communications of New England, Inc., Direct Testimony filed June 30, 1998, October 6, 1998.

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**California Public Utilities Commission, Pacific Gas & Electric General Rate Case**, Application No. 97-12-020, on behalf of the Office of Ratepayer Advocates of the California Public Utilities Commission, Direct Testimony filed June 4, 1998.

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*Record of Expert Testimony – Dr. Lee L. Selwyn*

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**Hawaii Public Utilities Commission**, *Instituting a Proceeding on Communications, Including an Investigation of the Communications Infrastructure of the State of Hawaii*, Docket No. 7702, on behalf of AT&T Communications of Hawaii, Inc., Direct Testimony filed (with James F. Recker) July 3, 1997, Rebuttal Testimony filed (with James F. Recker) August 28, 1997.

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**Illinois Commerce Commission**, *Illinois Bell Telephone company Petition for Approval of an NPA Relief Plan for the 847 Area Code*, Docket No. 97-0211, on behalf of Attorney General of the State of Illinois, Direct Testimony filed July 18, 1997, Rebuttal Testimony filed August 8, 1997, cross-examination August 13, 1997.

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**Maine Public Utilities Commission**, *New England Telephone and Telegraph Company d/b/a NYNEX Proposed Joint Petition for Reorganization Intended to Effect the Merger with Bell Atlantic Corporation*, Docket No. 96-388, on behalf of Office of Public Advocate, Direct Testimony filed October 16, 1996, cross-examination November 8, 1996.

**California Public Utilities Commission**, *Joint Application of Pacific Telesis and SBC Communications, Inc. for SBC to Control Pacific Bell (U1001C), Which Will Occur Indirectly as a Result of Pacific Telesis' Merger with a Wholly Owned Subsidiary of SBC*, Application No. 96-04-038, on behalf of the Office of Ratepayer Advocates of the CA Public Utilities Commission, Opening Testimony filed September 30, 1996, Surrebuttal Testimony filed November 12, 1996, cross-examination November 20-22, 1996.

**California Public Utilities Commission**, *Petition of AT&T Communications of California, Inc. for Arbitration Pursuant to Section 252 of the Federal Telecommunications Act of 1996 to Establish an Interconnection Agreement with Pacific Bell*, Application No. 96-08-040, on behalf of AT&T Communications of California, Inc., Opening Testimony filed August 20, 1996.

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**Canadian Radio-Television and Telecommunications Commission**, *AGT Limited General Rate Application 1996/97*, AGTRATE on behalf of the Canadian Cable Television Association, filed July 11, 1996.

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**Hawaii Public Utilities Commission**, *Application of GTE Mobilnet of Hawaii Inc. for a Certificate of Public Convenience and Necessity to Provide Cellular Radio Telecommunications Service in the Honolulu, Hawaii Metropolitan Statistical Area*, Docket No. 5180, on behalf of Honolulu Cellular Telephone Company, Direct Testimony filed August 15, 1985, cross-examination October 7, 1985.

**New York Public Service Commission**, *Proceeding on Motion of the Commission as to the Impact of the Modification of Final Judgement and the Federal Communications Commission's Docket 78-72 on the Provision of Toll Service in New York State*, Case No. 28425, on behalf of American Express Company, Capital Cities/ABC Inc., CBS Inc., National Broadcasting Company Inc., General Electric Company, Mobil Corporation, Sears, Roebuck and Company, Direct Testimony filed July 17, 1985.

**Arizona Corporation Commission**, *Application of the Mountain States Telephone and Telegraph Company for a Hearing to Determine the earnings of the company, a fair value for the company for ratemaking purposes, to fix a just and reasonable rate of return thereon, and to approve rate schedules designed to develop such return*, Docket Nos. E-1051-84-100, on behalf of Tele-Communications Association, Direct Testimony filed June 3, 1985, June 28, 1985, cross-examination August 20, 1985.

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**New York Public Service Commission**, *Proceeding on Motion of the Commission as to the Provision of Telephone Services that Bypass Local Exchange or Toll Networks*, Case No. 28710, Phase II, on behalf of American Express Company, ABC, Inc., CBS, Inc., National Broadcasting Company, Inc., General Electric Company, Mobil Corporation, Direct Testimony filed October 5, 1984, Rebuttal Testimony filed November 20, 1984.

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**California Public Utilities Commission**, *Application of GTE Mobilnet of San Francisco, and GTE Mobilnet of San Jose for certificates of public convenience and necessity to construct and operate a domestic cellular mobile radio system in the San Francisco-Oakland and San Jose Metropolitan areas*, Application No. 83-07-04, on behalf of McCaw/Intrastate Cellular Systems, Direct Testimony filed June 22, 1984, cross-examination July 5, 1984.

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**Pennsylvania Public Utilities Commission**, *Petition Requesting the Commission to Institute a Generic Investigation Concerning the Development of Intrastate Access Charges*, Docket No. 830452, on behalf of Bethlehem Steel Corporation, Burlington Industries, Fox Chase Medical Center, Honeywell, Inc., Jones and Laughlin Steel, Lehigh University, National Liberty Corporation, Pennsylvania Retailers, Pennsylvania State University, PPG Industries, Inc., Scott Paper Company, Sears, Roebuck and Company, Strawbridge and Clothier, Westinghouse Electric Corporation, Direct Testimony filed April 6, 1984, August 1, 1984, cross-examination April 26, 1984.

**Maine Public Utilities Commission**, *New England Telephone Company Re: Consideration of Local Measured Service and Alternative Exchange Service Options*, Docket No. 83-179, on behalf of Maine Public Advocate, Direct Testimony filed February 17, 1984.

**Maine Public Utilities Commission**, *New England Telephone and Telegraph Company Re: Proposed Increase in Rates*, Docket No. 83-213, on behalf of Maine Public Utilities Commission Staff, Direct Testimony filed February 7, 1984, Supplemental Testimony filed March 6, 1984, cross-examination March 15, 1984.

**Mississippi Public Service Commission**, *Notice of South Central Bell Telephone Company of its Intent to Revise its Rates for Intrastate Telephone Service throughout its Service Area in Mississippi, effective January 1, 1984*, Docket No. U-4415, on behalf of Mississippi Public Service Commission Staff, Direct Testimony filed January 24, 1984, cross-examination February 16, 1984.

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**Minnesota Public Utilities Commission**, *Petition of Northwestern Bell Telephone Company, Minneapolis Minnesota for Authority to Change its Schedule of Telephone Rates for Customers within the State of Minnesota*, Docket No. P-421-GR-83-600, on behalf of Minnesota Business Utility Users Council, Direct Testimony filed December 21, 1983, cross-examination January 27, 1984.

**New York Public Service Commission**, *New York Telephone*, Case No. 28601, on behalf of County of Suffolk, Town of Hempstead, Town Supervisors Association of Suffolk County, Direct Testimony filed December 14, 1983, Rebuttal Testimony filed January 1, 1984, Surrebuttal Testimony January 18, 1984, Rebuttal Testimony filed January 1, 1984.

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**Oregon Public Utilities Commission**, *Revised Tariff Schedules for Telephone Service in the State of Oregon Filed by Pacific Northwest Bell*, Docket No. UT-9, on behalf of Telephone Ratepayers for Cost-based Equitable Rates (TRACER), Direct Testimony filed October 27, 1983, Surrebuttal Testimony filed November 28, 1983.

**Kentucky Public Service Commission**, *Notice of South Central Bell of an Adjustment in its Intrastate Rates and Charges*, Docket No. 8847, on behalf of Kentucky Public Service Commission Staff, filed October 25, 1983.

**Indiana Public Service Commission**, *Petition of Indiana Bell: I. to Report Restructuring II. for Changes and Adjustment in its Rates, Tolls, Changes and Schedules for Telephone Service, Including Basic Exchange Service, III. Intrastate Wide Area Telephone Service and Message Toll Telephone Service, IV. Private Line Services and Channels and Certain Other Dedicated Facilities in Accordance with the Proposed Schedules Filed Herewith; and V. Establishment of Appropriate Intrastate Access Charges*, Cause No. 37200, on behalf of Utility Consumer Counselor. Direct Testimony filed October 21, 1983.

**Texas Public Utilities Commission**, *Petition of Texas PUC for Inquiry Concerning the Effects of the Modified Final Judgement and the Access Charge order upon Southwestern Bell and the Independent Companies of Texas*, Docket No. 5113; *Application of Southwestern Bell for Authority to Increase Rates*, Docket No. 5220, on behalf of Texas Retailers Association, Direct Testimony filed October 11, 1983.

**Pennsylvania Public Utilities Commission**, *Pennsylvania Public Utility Commission v. The Bell Telephone Company of Pennsylvania*, Docket No. R-832316, on behalf of Bethlehem Steel Corporation, Jones and Laughlin Steel Corporation, Lehigh University, PPG Industries Inc, Pennsylvania Retailers Association, Penn State University, Pomeroy's Department. Store, Scott Paper Company, Temple University of the Commonwealth System of Higher Education, U.S. Steel Corporation, Westinghouse Electric Corporation, Direct Testimony filed August 12, 1983, cross-examination September 1, 1983.

**Michigan Public Service Commission**, *Application of Michigan Bell for Authority to Revise its Schedule of Rates and Charges*, Docket No. U-7473, on behalf of the Association of Businesses Advocating Tariff Equity, Direct Testimony filed July 18, 1983, cross-examination August 17, 1983.

**Minnesota Public Utilities Commission**, *Investigation into Intrastate Access Charges of Twenty-Three Telephone Companies Operating in Minnesota*, Docket No. PUC-83-102-HC, on behalf of Minnesota Business Utility Users Council, filed on July 17, 1983.

**California Public Utilities Commission**, *Application of Pacific Telephone for Authority to Increase Certain Intrastate Rates and Charges Applicable to Telephone Services Furnished with the State of California due to Increased Depreciation Rates*, Application No. 82-11-07; *Application of Pacific Telephone for Authority to Increase Certain Intrastate Rates and Charges Applicable to Telephone Services Furnished with the State of California*, Application No. 83-01-22, on behalf of ABC, Inc., CBS, Inc., California Bankers Association, Telecommunications Association, Direct Testimony filed May 13, 1983, October 21, 1983.

**Kentucky Public Service Commission**, *Inquiry into the Resale of Intrastate- Wide Area Telecommunication Service*, Docket No. 261, on behalf of Commonwealth of Kentucky, Direct Testimony filed May, 1983, cross-examination May 17, 1983.

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**Florida Public Service Commission**, *Petition of Southern Bell Telephone and Telegraph Company for an Increase in its Rates and Charges*, 820294-TP, on behalf of Florida Department of General Services, Florida Ad Hoc Telecommunications Users Committee, Direct Testimony filed March 21, 1983

**Alabama Public Service Commission**, *Resale of WATS and Toll Services*, Docket Nos. 18548, 18617, on behalf of the State of Alabama, Direct Testimony filed February 28, 1983.

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**Washington Utilities and Transportation Commission**, *Washington Utilities and Transportation Commission v. Pacific Northwest Bell Telephone Company*, Docket No. U-82-19, on behalf of Tele-Communications Association, Direct Testimony filed November 10, 1982.

**Maryland Public Service Commission**, *Application of the Chesapeake and Potomac Telephone Company of Maryland for Authority to Increase and Restructure its Schedule of Rates and Charges*, Case No. 7661, on behalf of Maryland Industrial Group, Direct Testimony filed November 9, 1982.

**New York Public Service Commission**, *Proceeding on Motion of the Commission as to the Rates, Charges, and Regulations of New York Telephone*, Case No. 28264, on behalf of Suffolk County, Direct Testimony filed November 4, 1982, Rebuttal Testimony filed November 29, 1982.

**New York Public Service Commission**, *Proceeding on Motion of the Commission as to the Rates, Charges, and Regulations of New York Telephone*, Case No. 28264, on behalf of ABC, Inc., CBS, Inc., General Electric Company, and Mobil Corporation, Direct Testimony filed November 4, 1982, Rebuttal Testimony filed November 29, 1982.

**Minnesota Public Utilities Commission**, *Petition of Northwestern Bell, Minneapolis, Minnesota, for Authority to Change its Schedule of Rates*, Docket No. P-421/GR-79-388 (Remand), on behalf of Minnesota Department of Public Services, Direct Testimony filed October 5, 1982, Surrebuttal Testimony filed December 9, 1982, cross-examination January 19, 1983.

**Texas Public Utilities Commission**, *Petition of Southwestern Bell Telephone Company for Authority to Change Rates*, Docket No. 4545, on behalf of Texas Retailers Association, State Purchasing and General Services Commission, Direct Testimony filed August 25, 1982, Supplemental Testimony filed October 18, 1982.

**Massachusetts Department Public Utilities**, *New England Telephone and Telegraph Company Rates and Charges for Private Line Telephone Service*, Docket No. 1117 on behalf of Massachusetts Ad Hoc Committee of Telecommunication Users, Brigham and Women's Hospital, Children's Hospital Medical Center, Harvard School of Public Health, Harvard Medical School, Harvard School of Dentistry, Honeywell Corporation, Joslin Diabetes Foundation, Inc., Massachusetts College of Pharmacy and Allied Health Professionals, Medical Area Service Company, New England Deaconess Hospital, Polaroid Corporation, Sidney Farber Cancer Institute, Direct Testimony filed August 20, 1982, Surrebuttal Testimony filed October 4, 1982.

**Kentucky Public Service Commission**, *Notice of South Central Bell Telephone Company of Changes in its Intrastate Rates and Charges for Services and Increased Revenue Authority*, Docket No. 8467, on behalf of the Commonwealth of Kentucky, Direct Testimony filed July 26, 1982.

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**California Public Utilities Commission**, *Applications of the Pacific Telephone and Telegraph Company for authority to increase certain intrastate rates and charges applicable to telephone services furnished within the State of California*, Application Nos. 59849, 59269, on behalf of Telephone Answering Services of California, Inc., and Tele-Communications Association, Direct Testimony filed January 25, 1982, cross-examination February 9-10, 1982.

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**Illinois Commerce Commission**, *Illinois Bell Telephone Company*, Docket No. 81-0478, on behalf of Communication Users of Illinois, Direct Testimony filed November, 1981, cross-examination January 6, 1982.

**New York Public Service Commission**, *Proceeding of the Commission as to the rates, charges, rules and regulations of New York Telephone Company*, Case No. 27995, on behalf of ABC, Inc., CBS, Inc., General Electric Company, Mobil Corporation, Direct Testimony filed September 28, 1981, Surrebuttal Testimony filed October 13, 1981, cross-examination October 21, 1981, November 4, 1981.

**New York Public Service Commission**, *Proceeding of the Commission as to the rates, charges, rules and regulations of New York Telephone Company*, Case No. 27995, on behalf of Nassau County Suffolk County, Direct Testimony filed September 17, 1981, Surrebuttal Testimony filed October 13, 1981, cross-examination October 21, 1981, November 4, 1981.

**Texas Public Utilities Commission**, *Petition of Southwestern Bell Telephone Company for Authority to Change Rates*, Docket No. 3920, on behalf of Texas Retailers Association, State Purchasing and General Service Commission, Direct Testimony filed August 14, 1981, cross-examination October 1, 1981.

**Iowa State Commerce Commission**, *Rules Regarding Telephone Utilities Chapter 250-22 Iowa Administrative Code*, Docket No. RMU-81-4, on behalf of AID Insurance, Deere & Company, Dubuque Telegraph & Herald, Farmers Grain and Livestock, Fisher Controls Company, Hawkeye-Security Insurance Company, Meredith Corporation, Polk County, Quad City Times, Sioux City Journal, State of Iowa, Comments filed August 14, 1981.

**Maryland Public Service Commission**, *Application of the Chesapeake and Potomac Telephone Company of Maryland to establish appropriate principles for the pricing of competitive telephone services*, Case No. 7435, on behalf of Maryland Independent Group, Direct Testimony filed July 14, 1981, cross-examination October 20, 1981.

**Florida Public Service Commission**, *Petition of Southern Bell Telephone and Telegraph Company to place into effect certain new rates and charges pursuant to Section 364.05, Florida Statutes*, Docket No. 810035-TP, on behalf of Florida Ad Hoc Committee of Telecommunication Users, Direct Testimony filed June 22, 1981, Direct Supplemental June 30, 1981, cross-examination October 16, 1981.

**United States Senate**, Committee on the Judiciary, 97<sup>th</sup> Congress, *Hearings on the Monopolization and Competition in the Telecommunications Industry*, Oral Statement July 24, 1981.

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**Ohio Public Utilities Commission**, *Application of Cincinnati Bell Inc. for Authority to Adjust its Rates and Charges and to Change its Tariffs*, Docket No. 80-476-TP-AIR, on behalf of Tri-State Telecommunication Association, Direct Testimony filed March 27, 1981, cross-examination May 14, 1981.

**Utah Public Service Commission**, *Application of the Mountain States Telephone and Telegraph Company for Approval of an Increase in Rates and Associated Tariff Revisions*, Docket No. 80-049-01, on behalf of State of Utah Department of Finance, University of Utah, Utah State University, Weber State College, Brigham Young University, Direct Testimony filed March 6, 1981, Surrebuttal Testimony filed June 29, 1981, cross-examination April 9, 1981.

**California Public Utilities Commission**, *Applications of the Pacific Telephone and Telegraph Company for authority to increase certain intrastate rates and charges applicable to telephone services furnished within the State of California*, Application No. 59849, on behalf of ABC, Inc., CBS, Inc., California Retailers Association, Telecommunications Association, Direct Testimony filed January 26, 1981, cross-examination March 11-12, 1981.

**Maine Public Utilities Commission**, *New England Telephone and Telegraph Company Proposed Increase in Rates*, Docket No. 80-142, on behalf of State of Maine Department of Finance and Administration, Direct Testimony filed January 8, 1981, cross-examination March 15-16, 1981.

**1980**

**Maine Public Utilities Commission**, *New England Telephone and Telegraph Company Proposed Increase in Rates*, Docket No. 80-142, on behalf of Casco Bank and Trust Company, Direct Testimony filed December 22, 1980, Supplemental Testimony filed January 8, 1981, cross-examination March 15-16, 1981.

**Massachusetts Department of Public Utilities**, *Investigation by the Department on its own motion as to the propriety of the rates and charges filed by the new England Telephone and Telegraph Company on October 4, 1980*, Docket No. 411, on behalf of Massachusetts Ad Hoc Committee of Telecommunication Users, Direct Testimony filed December 15, 1980, Surrebuttal Testimony filed February 2, 1981.

**Arizona Corporation Commission**, *Determine the Earnings of the Company and the Valuation of all of the Company's Properties and a Fair Rate of Return Thereon*, Docket No. 9981-E-1051, on behalf of Telecommunications Association, Sears, Roebuck and Company, Direct Testimony filed December 10, 1980, June 17, 1981, cross-examination December 17, 1980.

**Pennsylvania Public Utilities Commission**, *Pennsylvania Bell*, Docket No. R-80061235, on behalf of Business Users Group, Direct Testimony filed December 5, 1980, cross-examination December 16, 1980.

**Missouri Public Service Commission**, *Filing by Southwestern Bell Telephone Company of New Intrastate Rates, Tolls, and Charges Applicable to Intrastate Telecommunication Services Furnished Within the State of Missouri*, Docket No. TR-80-256, on behalf of Missouri Retailers Association, Missouri Hotel and Motel Association, Armco, Inc., Direct Testimony filed October 31, 1980.

**Minnesota Public Utilities Commission**, *Petition of Northwestern Bell Telephone Company Minneapolis Minnesota for Authority to Change its Schedule of Private Line Telephone Rates for Customers within the state of Minnesota*, Docket No. P-421/M-80-306, on behalf of Minnesota Department of Public Services, Direct Testimony filed October 31, 1980, Surrebuttal Testimony filed December 10, 1980, cross-examination December 18, 1980.

**Indiana Public Service Commission**, *Petition of Indiana Bell for approval of changes and adjustments in rates,, and a proposal for measured telephone service*, Cause No. 36105, on behalf of Indiana Retail Council, Direct Testimony filed October 10, 1980, cross-examination October 27, 1980.

**Massachusetts Department of Public Utilities**, *Request for interim rate relief by New England Telephone and Telegraph Company*, Docket No. 380, on behalf of Massachusetts Ad Hoc Committee of Telecommunications Users, Direct Testimony filed October 3, 1980, cross-examination October 8, 1980.

**Texas Public Utilities Commission**, *Application of Southwestern Bell Telephone Company for Authority to Change Rates Statewide*, Docket No. 3340, on behalf of Texas Retailers Association State Purchasing and General Services Commission, Direct Testimony filed September 9, 1980, cross-examination October 20, 1980.

**Alabama Public Service Commission**, *Application of South Central Bell Telephone Company for a Rate Change*, Rehearing Docket No. 17743, on behalf of Attorney General of Alabama, Direct Testimony filed September 1980, cross-examination January 21, 1981.

**Illinois Commerce Commission**, *Illinois Bell Telephone Company*, Docket No. 80-0010, on behalf of Illinois Retail Merchants Association, Direct Testimony filed July 1980, cross-examination, July 28, 1980.

**New York Public Service Commission**, *Proceeding on motion of the Commission as to the rates, charges, rules and regulations of the New York Telephone Company for telephone service*, Case No. 27710, on behalf of ABC, Inc., General Electric Company, New York State Council of Retail Merchants, Direct Testimony filed July 9, 1980, Rebuttal Testimony filed August 4, 1980, cross-examination July 24, 1980.

**Texas Public Utilities Commission**, *Inquiry by the Public Utility Commission of Texas into Certain Cost Studies of Southwestern Bell Telephone Company*, Docket No. 2944, on behalf of Texas Retailers Association, Texas Alarm and Signal Association, Direct Testimony filed June 23, 1980.

**Texas Public Utilities Commission**, *Petition of Mountain States Telephone and Telegraph Company for Authority to Change Rates*, Docket No. 3040, on behalf of Texas Retailers Association, Direct Testimony filed March 31, 1980, cross-examination May 28-29, 1980.

**Ohio Public Utilities Commission**, *Complaint of the Ohio Bell Telephone Company Concerning Certain of its Filed Rates and Charges*, Docket No. 79-1185-TP SLF, on behalf of Ohio Council of Retail Merchants, Armco, Inc., General Electric Company, Direct Testimony filed March 17, 1980, cross-examination March 26, 1980.

**Michigan Public Service Commission**, *Application of Michigan Bell Telephone Company for authority to file Tariff MPSC No. 80 to provide for the offering of Republican National Convention Service and for the authority to withdraw Tariff MPSC No. 80 on or before October 1, 1980*, Docket No. U-6327, on behalf of Committee of Arrangement of the Republican National Convention, ABC, Inc., CBS, Inc., NBC, Inc., Direct Testimony filed January 25, 1980.

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**Louisiana Public Services Commission**, *Application of South Central Bell Telephone Company of Louisiana for authority to restructure and reprice its private line service rates*, Docket No. U-14252, on behalf of Alarm Association of Louisiana, Direct Testimony filed December 24, 1979, cross-examination January 17, 1980.

**Arizona Corporation Commission**, *Mountain States Telephone and Telegraph Company*, Docket No. 9981-E-1051, on behalf of Sears, Roebuck and Company, filed December 7, 1979, cross-examination March 16, 1980.

**Minnesota Public Service Commission**, *Petition of Northwestern Bell Telephone Company Minneapolis Minnesota for Authority to Change its Schedule of Telephone Rates for Customers within the state of Minnesota*, Docket No. P-421/GR-79-388 (Rate Design), on behalf of Participating Department Staff of the Minnesota Department of Public Services, Direct Testimony filed August 28, 1979.

**Texas Public Utilities Commission**, *Application of Southwestern Bell Telephone Company for a Statewide Rate Increase*, Docket No. 2673, on behalf of Texas Retailers Association, Direct Testimony filed August 27, 1979, cross-examination September 19, 1979.

**Minnesota Public Service Commission**, *Petition of Northwestern Bell Telephone Company Minneapolis Minnesota for Authority to Change its Schedule of Telephone Rates for Customers within the state of Minnesota*, Docket No. P-421/GR-79-388 (Business Information Systems), on behalf of Participating Department Staff of the Minnesota Department of Public Services, Direct Testimony filed August 24, 1979, Surrebuttal Testimony filed October 10, 1979, cross-examination September 12, 1979.

**Maryland Public Service Commission**, *Application of the Chesapeake and Potomac Telephone Company of Maryland for Authority to increase and restructure its schedule of rates and charges*, Case Nos. 7305/7335, on behalf of Banking and Savings Institute, Mayor and City Council of Baltimore, Hospital Association, Maryland Industrial Business Group, Maryland Association of Realtors, Greater Balto Board of Realtors, Montgomery, Anne, Arundel Harford, Howard, Prince George's County Board of Realtors Inc., Direct Testimony filed August 20, 1979, cross-examination September 4, 1979.

**Pennsylvania Public Utilities Commission**, *Pennsylvania Public Utility Commission et al v. The Bell Telephone Company of Pennsylvania*, Docket No. 719, on behalf of Pennsylvania Retailers Association, et al., General Electric Company, Westinghouse Electric Corporation, Manufacturers Association of Beaver County, Bethlehem Steel Corporation, Statement filed June 15, 1979, cross-examination June 21, 1979.

**New York Public Service Commission**, *Proceeding on motion of the Commission as to the rates, charges, rules, and regulations of the New York Telephone Company for telephone service*, Case No. 27469, on behalf of CBS, Inc., ABC, Inc., General Electric Company, New York State Council of Retail Merchants, Direct Testimony filed May 1, 1979, Rebuttal Testimony filed May 22, 1979, Surrebuttal Testimony filed June 6, 1979, cross-examination May 18, 1979, June 4 and 12, 1979.

**Michigan Public Service Commission**, *Application of Michigan Bell Telephone Company for authority to revise its tariff MPSC No.2 to provide for the offering of the Dimension 100 PBX System, Dimension 2000 PBX System, Dimension 100 PBX Service, Dimension 400 PBX Service, and Dimension 2000 PBX Service*, Docket Nos. U-5197, U-5330, U-4742, U-5753, U-5754, on behalf of Michigan Telephone Users Committee, Direct Testimony filed March 2, 1979.

**Pennsylvania Public Utilities Commission**, *Pennsylvania Public Utility Commission et al v. The Bell Telephone Company of Pennsylvania*, Docket No. 719, on behalf of Pennsylvania Retailers Association, et. al., General Electric Company, Westinghouse Electric Corporation, filed March 1, 1979, cross-examination March 1, 1979.

## 1978

**California Public Utilities Commission**, *Application of the Pacific Telephone and Telegraph Company for authority to increase certain intrastate rates and charges applicable to telephone services furnished within the State of California*, Application No. 58223, on behalf of California Retailers Association, Direct Testimony filed November 20, 1978, cross-examination December 12, 1979.

**Federal Communications Commission**, *American Telephone and Telegraph Company, Revisions to Tariff FCC Nos. 258 and 267, Transmittal No. 12478, Revisions to Tariff FCC No. 268, Transmittal No. 12500, Revisions to Tariff FCC No. 267, Transmittal No. 12853*, Docket No. 20690, on behalf of Hearing Division of the Common Carrier Bureau, filed November 6, 1978, cross-examination January 29-31, 1979.

**Virginia State Corporation Commission**, *Application of Chesapeake and Potomac Telephone Company of Virginia for authority to withdraw one-party business flat rate service, to time all message rates services, and to freeze offering of multi-party business service*, Docket No. 19994, on behalf of Virginia Business Committee for Equitable Telephone Rates, et. al, Direct Testimony filed October 16, 1978, cross-examination January 11, 1979.

**Oregon Public Utilities Commission**, *Revised Centrex Service Tariff Filed by Pacific Northwest Bell Telephone Company (on the Commissioner's Own Motion)*, Docket No. UF 3342; *Introduction of ESSX Telephone Service Schedules and the Elimination of New Centrex-CO Service Filed by Pacific Northwest Bell Telephone Company (on the Commissioner's Own Motion)*, Docket No. UF 3343, on behalf of General Electric Company, Georgia Pacific Company, Preliminary Direct filed December 2, 1977, Supplemental Direct filed September 22, 1978, cross-examination October 19, 1978.

**New York Public Service Commission**, *Proceeding on motion of the Commission as to the rates, charges, rules and regulations of the New York Telephone Company for telephone service.*, Case No. 27350, on behalf of ABC., Inc., CBS, Inc., General Electric Company, New York State Council of Retail Merchants, Direct Testimony filed September 8, 1978, cross-examination September 26, 1978.

**New Jersey Department of Energy**, *Petitions of New Jersey Telephone Company for Approval of Increases in Rates for Telephone Services*, Docket Nos. 7711-1136, 784-278, 784-279, on behalf of New Jersey Retail Merchants Association, Direct Testimony filed August 10, 1978.

**Federal Communications Commission**, *AT&T Charges for Private Line Services Revision of Tariff FCC No. 260 (Series 2000/3000)*, Docket No. 20814, on behalf of Ad Hoc Telecommunications Users Committee, Direct Testimony filed July 10, 1978, cross-examination August 25, 1978.

**California Public Utilities Commission**, *Investigation on the Commission's own motion into the rates, tariffs, costs, and practices of Centrex service by any or all of the telephone corporations listed in the investigation*, Application No. 10191, on behalf of California Retailers Association, California Manufacturers Association, Direct Testimony filed July 8, 1977, cross-examination July 26-27, 1977; Supplemental Direct Testimony filed February 1, 1978, cross-examination February 9, 1978; Second Supplemental Direct Testimony filed June 19, 1978, cross-examination October 24 and 26, 1978.

**Illinois Commerce Commission**, *Illinois Bell Telephone Company Proposed general increase in telephone rates applicable in all exchanges of the Company in Illinois*, Docket No. 78-0034, on behalf of Illinois Retail Merchants Association, Direct Testimony filed June 9, 1978, cross-examination July 10, 1978.

**Minnesota Public Service Commission**, *Petition of Northwestern Bell Telephone for Authority to Change Certain of its Rates for the Telephone Service Furnished to Customers in the State of Minnesota*, Docket No. P-421/GR-77-1509, on behalf of Participating Department Staff of the Minnesota Department of Public Services, Direct Testimony filed June 2, 1978, Supplemental Direct Testimony filed July 17, 1978, cross-examination June 20, 1978, July 27, 1978.

**Michigan Public Service Commission**, *Application of Michigan Bell Telephone Company for Authority to Revise its Tariff MPSC Nos. 1, 3, and 5*, Docket No. U-5719, on behalf of Michigan Business Telecommunication Users Committee, Direct Testimony filed May 22, 1978, cross-examination June 1, 1978.

**Texas Public Service Commission**, *Application of Southwestern Bell Telephone Company for a Statewide Rate Increase*, Docket No. 1704, on behalf of Texas Retailers Association, Direct Testimony filed May 12, 1978, cross-examination June 2, 1978.

**Washington Utilities and Transportation Commission**, *Washington Utilities and Transportation Commission v. Pacific Northwest Bell Telephone Company*, Docket No. U-77-50 U-77-51 U-77-52, on behalf of The Boeing Company, Sears, Roebuck and Company, Direct Testimony filed April 14, 1978, cross-examination April 25, 1978.

**Illinois Commerce Commission**, *Illinois Bell Telephone Company Proposed rates and regulations for Direct Inward Dialing Service for the Company-owned or Customer-provided PBX dial switchboards, applicable to all exchanges of the Company*, Docket No. 77-0511, on behalf of Spiegel, Inc., Sears, Roebuck and Company, Carle Foundation Hospital, Brunswick Corporation, Lord, Bessell & Brook, Direct Testimony filed March 23, 1978, cross-examination April 5, 1978.

**Federal Communications Commission**, *American Telephone and Telegraph Company (Long Lines Department), Wide Area Telecommunications Services (WATS)*, Docket No. 21402, on behalf of National Retail Merchants Association, filed January 17, 1978.

## 1977

**Oregon Public Utilities Commission**, *Revised Centrex Service Tariff Filed by Pacific Northwest Bell Telephone Company (on the Commissioner's Own Motion)*, Docket No. UF 3342, on behalf of General Electric Company, Georgia Pacific Company, filed November 30, 1977, cross-examination December 2, 1977.

**Michigan Public Service Commission**, *Application of Michigan Bell Telephone Company for Authority to Revise its Schedule of Rates and Charges*, Docket No. U-5125 - Reopening, on behalf of Michigan Business Telephone Users Committee, Direct Testimony filed October 17, 1977.

**Nevada Public Service Commission**, *Nevada Bell Telephone Company*, Docket No. 1180, on behalf of J C Penney, Direct Testimony filed October, 1977, cross-examination October 6, 1977.

**Pennsylvania Public Utilities Commission**, *Westinghouse Electric Corporation, Pennsylvania Retailers' Association et al; The Pennsylvania State University v. The Bell Telephone Company of Pennsylvania*, Docket Nos. 22188, 22185, 22184, on behalf of Westinghouse Electric Corporation, Pennsylvania Retailers Association, et. al., Pennsylvania State University, Direct Testimony filed June 20, 1977, cross-examination July 6, 1978.

**New York Public Service Commission**, *New York Telephone Company- Optional Single Message Unit Timing*, Case No. 27079; *Terminal Equipment and Intrastate Toll Rates*, Case No. 27089; *Telephone Rates*, Case No. 27100, on behalf of New York State Council of Retail Merchants, Direct Testimony filed May 16, 1977, cross-examination June 7, 1977, Rebuttal Testimony filed July 15, 1977, cross-examination July 20, 1977.

**Indiana Public Service Commission**, *Indiana Bell Telephone Company*, Cause No. 34809, on behalf of Indiana Retail Council, Direct Testimony filed May 2, 1977, cross-examination May 9, 1977.

**Florida Public Service Commission**, *Petition of Southern Bell Telephone and Telegraph Company for Consent to Place into Effect Certain Rate Schedules*, Docket No. 760842-TP, on behalf of General Services Administration, filed March 21, 1977, cross-examination May 18-19, 1977.

**Maryland Public Service Commission**, *Application of the Chesapeake and Potomac Telephone Company of Maryland for authority to increase and restructure its schedule of rates and charges*, Case No. 7025, on behalf of Retail Merchants Association of Baltimore, Inc., Direct Testimony filed March 7, 1977, cross-examination March 16, 1977.

**Missouri Public Service Commission**, *Cost of Service Study of Southwestern Bell Telephone Company*, Docket No. 18309, on behalf of Missouri Retailers Association, filed February 16, 1977, cross-examination March 9, 1977.

**Illinois Commerce Commission**, *Illinois Bell Telephone Company Proposed general increase in telephone rates applicable to all exchanges of the Company in Illinois*, Docket No. 76-0409, on behalf of Illinois Retail Merchants Association, Direct Testimony filed January 1977, cross-examination January 30, 1977.

**1976**

**Texas Public Utilities Commission**, *Application of Southwestern Bell Telephone Company for Statewide Rate Increase*, Docket No. 78, on behalf of Texas Retail Federation, Direct Testimony filed October 26, 1976, cross-examination November 17-18, 1976.

**California Public Service Commission**, *Application of the Pacific Telephone and Telegraph Company, a corporation, for telephone service rate increases to cover increased costs in providing telephone service*, Application No. 55492, on behalf of California Retailers Association, California Manufacturers Association, Direct Testimony filed October 11, 1976, cross-examination October 27, 1976.

**Michigan Public Service Commission**, *Application of Michigan Bell Telephone Company for Authority to Revise its Schedule of Rates and Charges*, Docket No. U-5125, on behalf of Michigan Business Telephone Users Committee, Direct Testimony filed October 11, 1976, cross-examination November 4-5, 1976.

**Illinois Commerce Commission**, *Illinois Bell Telephone Company Proposed rate increase for Private Line and Mileage Services, revisions and increases for Telephone Answering Service Equipment and Services applicable to all exchanges of the company in Illinois*, Docket No. 76-0200, on behalf of Illinois Retail Merchants Association, Direct Testimony filed October 1976, cross-examination November 10, 1976.

**Missouri Public Service Commission**, *Southwestern Bell Telephone Company of St. Louis Missouri for authority to file tariffs reflecting an increase in rates for telephone service provided to customers in the Missouri service area of the Company*, Docket Nos. 18660, 18661, on behalf of Missouri Retailers Association, Direct Testimony filed September 1, 1976, cross-examination October 14, 1976.

**New Jersey Public Utilities Commission**, *Petition Filed by New Jersey Bell Telephone Company Increasing its Rates, Message Toll Rates and Charges for Certain Items of Equipment, Facilities, and Service in the State of New Jersey*, Docket No. 7512-1251, on behalf of New Jersey Retail Merchants Association, Direct Testimony filed May 17, 1976, cross-examination June 16, 1976.

**Minnesota Public Utilities Commission, Office of Administrative Hearings**, *Petition of Northwestern Bell Telephone Company for an Increase in Rates for Telephone Service in the State of Minnesota*, Hearing Docket No. PSC-76-013-BS, Agency Docket No. P-421/GR-75-496 (U-75-496), on behalf of Minnesota Retail Federation, Direct Testimony filed May 3, 1976, cross-examination May 17, 1976.

**Ohio Public Service Commission**, *Application of the Ohio Bell Telephone Company for authority to increase and adjust its Rates and Charges and to Change Regulations and Practices Affecting its Rates and Charges in each of its Duly Filed Intrastate Tariffs*, Docket No. 74-761-TP-AIR, on behalf of Ohio Counsel of Retail Merchants, Direct Testimony filed March 5, 1976, cross-examination March 18, 1976.

**1975**

**Florida Public Service Commission**, *Petition of Central Telephone Company of Florida and Florida Central Telephone Company for Authority to Increase their Rates and Charges to Rates and Charges that are Fair and Reasonable*, Docket No. 750320-TP, on behalf of State of Florida, Direct Testimony filed November 21, 1975, cross-examination December 17, 1975.

**New Mexico State Corporation Commission**, *Mountain States Telephone and Telegraph Company*, Docket No. 673, on behalf of New Mexico Retail Association, Direct Testimony filed October 30, 1975, cross-examination November 3-4, 1975.

**North Carolina Utilities Commission**, *Application of Southern Bell Telephone and Telegraph Company for Authority to Increase its Local Exchange Rates and Charges Throughout its Franchised Areas in North Carolina*, Docket No. P-55 Sub 742, on behalf of North Carolina Retail Merchants Association, Direct Testimony filed September 23, 1975, cross-examination October 16, 1975.

**Illinois Commerce Commission**, *Illinois Bell Telephone Company proposed general increases in telephone rates applicable to all exchanges of the company in Illinois*, Docket No. 59666, on behalf of Illinois Retail Merchants Association, Direct Testimony filed September 10, 1975, cross-examination September 29-30, 1975.

**Oklahoma Corporation Commission** *Application of Southwestern Bell Telephone Company to Establish New Intrastate Rates, Tolls and Charges Applicable to Certain Intrastate Telephone and Telecommunications Services Furnished within the State of Oklahoma and to Authorize Directory Assistance Charges*, Docket No. 25444, on behalf of Oklahoma Retailer Merchants Association, Direct Testimony filed August 20, 1975, cross-examination waived.

**Florida Public Service Commission**, *Petition of Southern Bell Telephone and Telegraph Company under Section 364.05, Florida Statutes for Consent to Place in Effect Certain New Rate Schedules*, Docket No. 74805-TP, on behalf of Florida Retail Federation, Direct Testimony filed July 11, 1975, July 18, 1975, cross-examination June 30, 1975, July 29, 1975, October 8, 1975.

**Florida Public Service Commission**, *Petition of General Telephone Company of Florida under Section 364.05, Florida Statutes, that Consent be Given to the Placing in Effect of the New Rate Scheduled filed herewith to Accomplish an Increase in the Rates and Charges for Intrastate Telephone Services Rendered by Said Company to the Level of Reasonable Compensation for such Services and in the Alternative for Partial Relief on an Interim Basis*, Docket No.74792-TP , on behalf of Florida Retail Federation, Direct Testimony filed June 18, 1975, July 18, 1975, cross-examination June 30, 1975, July 29, 1975.

**Massachusetts Department of Public Utilities**, *Investigation by the Department on its own motion as to the Propriety of the Rates and Charges set forth in Revised Pages of its Tariffs Filed by the New England Telephone and Telegraph Company*, Docket No. 18210, on behalf of The Foxboro Company, Sears, Roebuck and Company, Jordan Marsh Company, Position Paper submitted May 29, 1975, Direct Testimony filed July 18, 1975, cross-examination August 29, 1975.

**Arizona Corporation Commission**, *Request of Mountain States Telephone and Telegraph Company for the Commission to Determine the Earnings of the Company and the Valuation of all of the Company's Properties and a Fair Rate of Return.*, Docket No. 9981-E-1051, on behalf of Sears, Roebuck and Company, J C Penney Company, Inc., Montgomery Ward and Company, Carter Hawley Hale Stores, Inc., Levy's, Direct Testimony filed February 11, 1975, cross-examination February 20, 1975.

**Missouri Public Service Commission**, *Filing by Southwestern Bell Telephone Company of New Intrastate Rates, Tolls, and Charges Applicable to Intrastate Telecommunication Services Furnished Within the state of Missouri*, Docket No. 18138, on behalf of Missouri Retailers Association, Direct Testimony filed January 21, 1975.

**1974**

**Colorado Public Utilities Commission**, *Mountain States Telephone and Telegraph Company*, Docket No. 867, on behalf of Sears, Roebuck and Company, J C Penney Company, Inc., filed November, 1974, cross-examination November 18, 1974.

**Georgia Public Service Commission**, *Application for an adjustment in the Scheduled of Rates and Charges for the Intrastate Service Furnished by Southern Bell Telephone and Telegraph Company of Georgia*, Docket No. 2632U, on behalf of Georgia Retailers Association, Direct Testimony filed October 2, 1974, cross-examination October 30, 1974.

**District of Columbia Public Service Commission**, *Complaint and Application of the Chesapeake and Potomac Telephone Company for Hearing and Investigation Regarding Its Current Level of Earnings and Level of Rates*, Docket No. 595, on behalf of General Services Administration and the District of Columbia Department of Highways and Traffic, Direct Testimony filed September 5, 1974, cross-examination September 12, 1974.

**Oklahoma Corporation Commission**, *Southwest General Telephone Company*, Docket No. 25048, on behalf of Oklahoma Retail Merchants Association, Direct Testimony filed February 18, 1974, cross-examination February 20, 1974.

### **1973**

**New Mexico State Corporation Commission**, *Application of Mountain States Telephone and Telegraph Company for an Adjustment in Rates and Charges for Intrastate Telephone Service Furnished by it Within the State of New Mexico*, Docket No. 567, on behalf of New Mexico Retailers Association, Direct Testimony filed October 3, 1973, cross-examination October, 1973.

**New Mexico State Corporation Commission**, *Review of General Telephone Company of the Southwest Proposed Rates and Tariff*, Docket No. 533; and *Complaint of JC Penney Company and Sears Roebuck and Company Re: General Telephone Company of the Southwest's General Exchange Tariff Section 40- Access Charge Service*, Docket No. 566, on behalf of J C Penney Company, Inc., Sears, Roebuck and Company, Direct Testimony filed July 25, 1973, Supplemental Direct Testimony filed December 19, 1973, cross-examination January 8, 1974.