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June 28, 2016

By ECFS

Marlene H. Dortch
Office of the Secretary
Federal Communications Commission
455 12th Street, S.W.
Washington, DC 20054

Re: WC Docket No. 05-25: **Public** Version of the Second IRW White Paper

Dear Ms. Dortch:

Pursuant to the *Protective Orders* adopted by the Commission in WC Docket Nos. 16-143, 15-247, 05-25, and RM-10593,[1] enclosed is a white paper entitled *Analysis of the Regressions and Other Data Relied Upon in the Business Data Services FNPRM And a Proposed Competitive Market Test*, which has been prepared by Mark Israel, Daniel Rubinfeld, and Glenn Woroch (the "*Second IRW White Paper*"). The enclosed version of this document has been redacted for public inspection. We are concurrently filing a Highly Confidential version.

Individuals who are admitted to the *Protective Orders* in these proceedings can request an unredacted copy of this document by contacting Marc Korman of Sidley Austin LLP (mkorman@sidley.com).

Respectfully,

/s/ Glenn Woroch

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Glenn Woroch

Enclosure

[1] *See* Order, *Business Data Services in an Internet Protocol Environment; Investigation of Certain Price Cap Local Exchange Carrier Business Data Services Tariff Pricing Plans; Special Access for Price Cap Local Exchange Carriers; AT&T Corporation Petition for Rulemaking to Reform Regulation of Incumbent Local Exchange Carrier Rates for Interstate Special Access Services*, WC Docket Nos. 16-143, 05-25, RM-10593 (rel. Jun. 24, 2016) (collecting citations for the protective orders previously issued in these proceedings).

Analysis of the Regressions and Other Data Relied Upon in the Business Data Services FNPRM And a Proposed Competitive Market Test

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Second White Paper

June 28, 2016

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I. SUMMARY

On January 16, 2016, in response to the Federal Communications Commission's (the "Commission") first request for analysis of its 2013 Special Access Data Collection ("SADC"), we submitted detailed analyses demonstrating that these data confirm that the marketplace for Business Data Services ("BDS")—the new name the Commission has given to Special Access services—is robustly competitive.[1] We showed, for example, that as of 2013, competitive providers had deployed facilities that compete with ILEC BDS offerings in more than 95% of the census blocks with BDS demand, and that those census blocks represent about 97% of all locations with BDS connections and about 99% of all business establishments in census blocks where BDS are purchased. We thus concluded that there is no economic basis for significant additional regulation of those services.

On May 2, 2016, the Commission issued a Further Notice of Proposed Rulemaking ("*FNPRM*").[2] This *FNPRM* contains various analyses conducted by internal Commission staff, plus regression results presented by the Commission's outside economic consultant, Prof. Marc Rysman, in a white paper attached to the *FNPRM*.[3] These analyses purport to find that ILECs exercise market power for TDM-based DS1 and DS3 services in some areas. The *FNPRM* seeks comment on these analyses, including their implications for market power and regulation of DS1

[1] *See* Mark Israel, Daniel Rubinfeld, and Glenn Woroch, Competitive Analysis of the FCC's Special Access Data Collection: White Paper, *Special Access Rates for Price Cap Local Exchange Carriers, AT&T Corp. Petition for Rulemaking to Reform Regulation of Incumbent Local Exchange Carrier Rates for Interstate Special Access Services*, WC Docket No. 05-25, RM-10593 (filed Jan. 26, 2016) ("IRW White Paper").

[2] Tariff Investigation Order and Further Notice of Proposed Rulemaking, *Business Data Services in an Internet Protocol Environment, Investigation of Certain Price Cap Local Exchange Carrier Business Data Services Tariff Pricing Plans, Special Access Rates for Price Cap Local Exchange Carriers, AT&T Corp. Petition for Rulemaking to Reform Regulation of Incumbent Local Exchange Carrier Rates for Interstate Special Access Services*, WC Docket Nos. 16-143, 15-247, 05-25, RM-10593 (rel. May 2, 2016) ("*FNPRM*").

[3] Marc Rysman, "Empirics of Business Data Services: White Paper," attached as Appendix B to the *FNPRM* ("Rysman White Paper").

and DS3 services, as well as whether the findings for DS1 and DS3 services also justify regulation of Ethernet-based services at speeds in the range of DS1 and DS3 services. The *FNPRM* also seeks comment on an appropriate "Competitive Market Test" (or "CMT") that can delineate, with geographic granularity, the areas where ILECs are subject to competition from non-ILEC providers, and the areas where they are not. We address these issues in this paper.

First, we demonstrate that the 2013 SADC, as well as other data contained in the *FNPRM*, confirm that the marketplace for BDS is highly competitive. We agree with the findings in the *FNPRM*, and by Prof. Rysman, that BDS providers compete for customers within about a half mile of their network facilities.[4] Data in the SADC confirm that, even as of 2013, virtually all buildings with demand for BDS were well within a half mile of competitive facilities (indeed, 75% are within only 456 feet of competitive facilities). Those data further confirmed that about 80% of even sub-50 Mbps bandwidth was within 1,000 feet of competitive fiber.[5] In addition, the 2013 data showed that competitive providers earned more than half of all BDS revenues. Notably, all of these metrics *necessarily understate* the true extent of competition because they do not account for the dramatic expansion of competitive facilities since 2013,[6] and they ignore BDS services offered by cable companies using their hybrid fiber coaxial ("HFC") networks.

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[4] *FNPRM* ¶ 161; Rysman White Paper p. 219. *See also* Declaration of Jonathan B. Baker on Market Power in the Provision of Dedicated (Special Access) Services, *Special Access Rates for Price Cap Local Exchange Carriers, AT&T Corp. Petition for Rulemaking to Reform Regulation of Incumbent Local Exchange Carrier Rates for Interstate Special Access Services*, WC Docket No. 05-25, RM-10593, at ¶ 43 (filed Jan. 28, 2016) ("Baker Decl.") ("A provider is considered nearby if it is not presently providing service to the customer location but has fiber within either the same census block or a census block with a boundary less than 0.5 miles away.").

[5] Second Supplemental Declaration of Mark Israel, Daniel Rubinfeld and Glenn Woroch, *Special Access Rates for Price Cap Local Exchange Carriers, AT&T Corp. Petition for Rulemaking to Reform Regulation of Incumbent Local Exchange Carrier Rates for Interstate Special Access Services*, WC Docket No. 05-25, RM-10593, at ¶ 5 and p. 10 (filed Apr. 20, 2016) ("IRW Second Supp. Decl.").

[6] *See* Vertical Systems Group, *Mid-Year 2015 U.S. Carrier Ethernet LEADERBOARD* (Aug. 24, 2015), http://www.verticalsystems.com/vsglb/mid-year-2015-u-s-carrier-ethernet-leaderboard/.

Second, the regressions presented in the Rysman White Paper (attached to the *FNPRM*) cannot establish the presence of ILEC market power in the BDS marketplace. Those analyses attempt to evaluate market power by establishing, with regressions, that ILEC prices for DS1 and DS3 prices are lower in areas with one or more BDS competitive providers. However, to establish market power using his approach, it is necessary to demonstrate that adding a new competitor to a given area *causes* lower prices. An inference of market power cannot be drawn if, instead, the presence of competitors in an area is simply correlated with the underlying cost or demand conditions, with those conditions also being the source of observed ILEC price differences across areas. The regression analyses presented in the Rysman White Paper do not establish any causal relationship between ILEC prices and the existence of other competitive providers.

Third, our analysis of the SADC data did not uncover evidence of market power for Ethernet services. On the contrary, the data confirm that the marketplace for Ethernet services is highly competitive, with dozens of providers, and no provider having a dominant market share. Furthermore, to the extent the Commission chooses to rely on the type of flawed regressions set forth in the Rysman White Paper, those regressions, when applied to Ethernet services with bandwidth equal to 45 Mbps and lower, show that ILEC prices are not lower in areas where other providers have deployed Ethernet facilities.

Finally, we propose a simple CMT that identifies—at a fine degree of geographic granularity—those areas where, according to the 2013 SADC, there is clearly competition for BDS. Under this test, all census tracts with at least two providers within 2,000 feet would be designated as competitive. We validated this CMT using the 2013 SADC. These data confirm that virtually all ILEC buildings and bandwidth within these census tracts are within 2,000 feet

of at least two providers' networks. This is true for all levels of bandwidth, including services in the sub-50 Mbps range.

II. OUR REVIEW OF THE SPECIAL ACCESS DATA COLLECTION CONFIRMS THAT THE MARKETPLACE FOR BUSINESS DATA SERVICES IS HIGHLY COMPETITIVE.

As we previously demonstrated, the Commission's data collection shows that BDS customers have multiple facilities-based options in almost all areas where there is demand for those services. The *FNPRM* acknowledges these facts, but seeks comment on alleged "direct evidence" and other indicia of market power for low-bandwidth BDS. The principal "direct evidence" is the set of regressions presented in the Rysman White Paper. We have reviewed these regressions and other alleged indicia of market power and, for the reasons explained below, we find that none of this evidence establishes that ILECs exercise market power.

A. The Data Collected By The Commission Confirm That The Marketplace For BDS Is Highly Competitive.

As we previously demonstrated, the Commission's 2013 SADC confirms that there is robust competition in the marketplace for BDS. A proper analysis of competition for BDS must account for how competition for BDS occurs. As we (and other economists) have shown, BDS providers deploy facilities in areas where there is demand for BDS, which they can cost-effectively serve using nearby facilities, and they then compete for customers in those areas. When they win customers, they connect their facilities to the buildings where those customers are located. For this reason, a proper analysis of BDS competition for any location must account for facilities deployed both at each specific location and sufficiently *near* that location, with the standard for "sufficiently near" discussed below.

The evidence submitted by the CLECs and other economists in this proceeding demonstrates that providers compete for customers within about a half mile of their network

facilities.[7] The data submitted to the 2013 SADC confirm that, even as of 2013, most buildings with demand for BDS were well within this distance. Even ignoring cable operators' HFC networks, about half of the buildings with BDS demand that are served only by an ILEC were within 88 feet (0.017 miles) of at least one other provider's fiber facilities, 75% were within 456 feet (0.086 miles), and 90% were within about 1,107 feet (0.21 miles), and virtually all (98.7%) were within a half mile.[8]

The results are equally dramatic when examining the level of BDS demand as measured by bandwidth. For example, about 98% of BDS bandwidth served by AT&T as an ILEC is located in buildings that are less than a half mile from at least one competitive network; that figure is 96% for CenturyLink.[9] We find that most ILEC bandwidth is also exposed to close competition when the universe is limited to sub-50 Mbps connections: 90% of AT&T's sub-50 Mbps bandwidth, and 88% of CenturyLink's sub-50 Mbps bandwidth, is within a half mile of competitive fiber.[10]

The *FNPRM* also asks whether there is evidence that two or more non-ILEC competitors are required to achieve competitive results. As we explain in Part IV.C below, the answer is no. However, if the Commission were to conclude (in our view, incorrectly) that two or more non-ILEC networks are needed to achieve competitive results, the 2013 SADC still confirms that most demand meets this condition. For example, we have shown that, according to the 2013

[7] *FNPRM* ¶ 161; Rysman White Paper p. 219; Baker Decl. ¶ 43.

[8] IRW Second Supp. Decl. ¶¶ 5-6 (Table).

[9] *Id.* ¶ 14 (Tables).

[10] *Id.*

SADC, the vast majority of AT&T and CenturyLink BDS demand is located in buildings that are within 1,000 feet of two or more other provider networks.[11]

Since all of the metrics above exclude HFC facilities deployed by cable companies, they *necessarily understate* the true extent of BDS competition. Cable company HFC coverage data as of 2013 were available at the census block level from the National Broadband Map data.[12] Census blocks are quite small, which means that providers' networks located within a census block are generally much closer than a half mile to any potential BDS customers within the census block.[13] Accounting for HFC facilities in this way reveals that Metropolitan Statistical Area ("MSA") census blocks with at least one non-ILEC competitor account for about 99% of all business establishments.[14]

The 2013 data further confirm that competitors have collectively been highly successful in competing for and winning large portions of the BDS marketplace. As shown in the *FNPRM,* competitive providers earn more in revenues from BDS services than do ILECs: even excluding cable company revenues, competitive providers earned $23 billion of the $45 billion in BDS revenues for 2013.[15] Further, the *FNPRM* points out that six of the top eight providers of Ethernet BDS, measured by Ethernet port shares, are non-ILECs.[16]

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[11] *Id.*

[12] National Telecommunications and Information Administration, National Broadband Map, *available at* http://broadbandmap.gov/.

[13] The *FNPRM* acknowledges that facilities in a census block indicate that the facilities can typically compete for customers throughout the census block. *FNPRM* ¶ 214.

[14] IRW White Paper p. 17.

[15] *FNPRM* ¶ 271, Figure 9. Prof. Rysman presents a table with similar results. *See* Rysman White Paper p. 216, Table 1. Prof. Rysman suggests that revenues earned from ILEC-affiliated CLECs should be allocated as ILEC revenue. But the issue is whether ILECs exercise market power in their operating territories by virtue of their incumbent status. These data show that ILECs have lost more than half of the marketplace revenues to competitors in their respective regions. It makes no difference whether those competitors are affiliated with other ILECs or other entities. Similarly, the *FNPRM* points out that CLEC retail revenues in this chart include revenues earned from services provided using ILEC-provided special access and UNE services, and hence raises the question as to

These data confirm that, even as of 2013, non-ILEC providers of BDS had built networks that could meet the demand in most areas where there is demand for BDS, that they used those facilities to compete for BDS customers, and that they have been successful in winning BDS customers and BDS revenues.[17] Moreover, these competitive metrics likely understate the extent of competition *today* because they do not account for the network expansions by competitive providers that have been underway since 2013.

B. The Alleged Evidence of Market Power for DS1 and DS3 Services.

The *FNPRM* attaches a study by Prof. Marc Rysman that presents regressions based on data sets prepared by Commission Staff, and it seeks comment on whether these regressions establish that ILECs exercise market power. In addition, the *FNPRM* seeks comment on a list of other potential indicia of market power. We have reviewed this evidence and, for the reasons set forth below, we conclude that neither the regressions nor other indicia identified in the *FNPRM* establish that ILECs exercise market power.

We note at the outset, however, that we have had access to these regressions for only a very short time. Although the Commission released the *results* of the analyses on May 2, 2016, it did not release the programs used to create the data sets on which these analyses are based until May 18, 2016. As a result, we could not begin the process of replicating and analyzing the regression results until about May 18, 2016. In addition, we later learned that even these data were incomplete because they omitted important information about the coverage of cable

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whether the retail revenues earned by the CLEC from such services should instead be allocated to the ILEC. The answer is again is no. The main issue is whether ILECs are constrained by competition. The revenue shares in this table confirm that CLECs can and do effectively compete for retail customers using ILEC-provided special access and UNE facilities.

[16] *FNPRM* ¶ 83, Chart 1.

[17] Even in the few areas where competitors have chosen to not deploy facilities, Congress and the Commission have already implemented regulatory safeguards by mandating the provision of UNEs by ILECs at TELRIC-based prices.

companies' Ethernet services as of 2013. These data were not added to the NORC Enclave (where the 2013 SADC is maintained) until June 7, 2013. Although parties sought extensions of time to comment in this proceeding to account for these delays, we understand that the Commission rejected those requests. As a result, we effectively have had only about three weeks to work with the regressions and full data sets and to draft this report.[18] By contrast, it appears that the Commission Staff and Prof. Rysman spent the better part of nine months preparing these regressions. For these reasons, our analyses of the regressions presented in the Rysman White Paper are ongoing. Nonetheless, even with this truncated time to analyze these regressions, it is clear that they do not establish ILEC market power, including for many of the reasons that Prof. Rysman himself correctly identifies.

1. The Regressions Presented By Professor Rysman Do Not Establish Market Power For DS1 or DS3 Services.

The *FNPRM* attaches a paper by Prof. Rysman presenting the results of a series of 38 regressions. Prof. Rysman concludes that these regressions provide no evidence of market power for any services above 45 Mbps. On the other hand, with several important caveats, Prof. Rysman concludes that these regressions are consistent with the ILECs exercising a small degree of market power for DS1 and DS3 services. The regressions do not, however, address whether ILECs exercise market power for low-bandwidth (45 Mbps and lower) Ethernet services.

For the reasons explained below, we disagree with Prof. Rysman's conclusions that the regressions indicate that ILECs exercise market power for DS1 and DS3 services.

[18] In addition, we note that the Commission and Prof. Rysman appear to have conducted their analyses using data that has not been made available to third parties, including, for example, the amount of bandwidth associated with connections above 1 Gbps. For these reasons, although we have been able to closely replicate the regressions presented by Prof. Rysman, we have not been able to exactly reproduce his numerical results.

a. The Endogeneity Problem

Prof. Rysman seeks to identify ILEC market power in a way that, in certain conditions, can be economically logical, but the econometric analyses he relies upon are invalid. The core problem with his approach is that it does not isolate sources of variation in the data that would permit *causal* inferences about the effects of competition on BDS prices. As such, his approach does not permit one to make reliable inferences about ILEC market power.

Prof. Rysman attempts to demonstrate market power by establishing, with regressions, that adding an additional BDS competitor to a given area *causes* ILEC prices to fall by a significant amount in that area. If this is true, then he concludes that, as a matter of economics, ILECs exercise market power in the areas that do not yet have such additional competition, and such market power is reduced or eliminated—leading to lower prices—when additional competitors enter.

Critical to this approach is the need to establish a *causal* relationship—that an additional competitor *causes* prices to fall—not just a *correlation* between number of competitors and price levels. The need to separate causality from correlation here is far more than a technical or academic concern. It goes to the heart of Prof. Rysman's approach. To establish market power using his approach, one must show that adding a new competitor to a given area *causes* lower prices. An inference of market power cannot be drawn if, instead, the presence of more or less competitors in an area is simply correlated with the underlying economic conditions in that area, with those economic conditions being the source of observed ILEC price differences across areas. That is, to establish market power, Prof. Rysman must show that, *holding economic conditions constant*, adding an additional competitor *causes* lower ILEC prices. If instead, relevant economic conditions are not held constant, then the approach is not valid.

For example, suppose there is variation in the incremental cost of providing BDS services across areas. Then, economics predicts there will be lower BDS prices in areas with lower costs *and* there will be more competitors in those areas, with both the lower prices and greater number of competitors arising from the more attractive cost conditions. In this case, prices in areas with more competitors will be lower than prices in the areas with fewer competitors, entirely due to the effect of cost on both number of competitors and prices, even if there is no causal linkage between number of competitors and price. The problem is that price comparison across areas does not hold economic conditions constant; instead, it compares areas with different costs, and thus it cannot support a causal inference about the effect of the number of competitors on price.

In the language of econometrics, the problem is that much of the variation across areas in the number of competitors is "endogenous," meaning driven by the underlying economic conditions in the area. Other portions of the variation in the number of competitors may be "exogenous," meaning uncorrelated with the underlying economic conditions in the area. In econometrics, the way one "holds relevant economic conditions constant" in drawing inferences is to rely *only* on exogenous variation. In the present situation, that amounts to relying on the portion of variation in the number of competitors that is not driven by underlying economic conditions, *i.e.*, the variation that can be used to identify the effect of the number of competitors independent of the confounding influence of underlying economic conditions on prices.

In many ways the need to find exogenous sources of variation is the challenge at the heart of econometrics. In other sciences, this challenge can be dealt with via controlled laboratory experiments. Subjects are randomly assigned to different groups, meaning that the group they are in is not correlated with "underlying conditions" that affect the outcome of the experiment. Then one randomly selected group, is, for example, subjected to a new drug therapy, with the

effects of interest measured relative to the control group not subjected to the therapy in order to isolate the effects of the therapy from all other factors.

Of course, such controlled experiments are not possible in the present context or in most economic studies. As a result, econometricians have designed alternative approaches, all of which are based on isolating the exogenous sources of variation in a variable of interest (here the number of competitors) from the endogenous ones (*e.g.*, cost and demand conditions) and relying only on the exogenous variation to outcome of interest—here the effect on prices. These approaches take many different names ("instrumental variables," "event studies") but at their core, all are seeking to isolate exogenous sources of variation and to use only this variation to identify the effect of interest in a way that is not confounded by the effect of underlying economic conditions.

Two examples illustrate these issues. First, suppose, counterfactually, that there were only a very small number of CLECs, and that one of them was known to operate only in a subset of states, for corporate or legal/regulatory reasons, having nothing to do with economic conditions in those states. Then one could look just at the variation in the average number of competitors in the states where that CLEC did or did not operate and, assuming there were more competitors where that CLEC did operate, correspondingly compare average BDS prices across the states where that CLEC did or did not operate, to measure the effect of additional CLEC competition. In the language of econometrics, a variable indicating the states in which the CLEC operated would be known as an "instrumental variable" or an "instrument." Critically, one would intentionally not rely on all the other sources of variation in number of competitors (including variation across blocks strictly within or outside the CLEC's territory), as those other sources of variation would include endogenous variation and thus not permit valid causal

inferences about the effects of competition on prices. Only the variation related to the instrument would be used.

Alternatively, suppose there were a known event where, say, a CLEC had made a major investment to serve a building in a particular block, but then also decided to buildout to serve many surrounding blocks. The competition that occurred in those *surrounding* blocks would arguably be exogenous—meaning not driven by the underlying economic conditions in those blocks—since it was driven as an offshoot of the original project (assuming the CLEC did not condition entry in the surrounding blocks on expectation of business in particular blocks). In this "event study," one could then look at what happened (over time) to prices in those surrounding blocks following the CLEC's entry, relative to what happened in other blocks that did not have CLEC entry during the same time period. Again, critically, one would *only* use the source of variation related to the exogenous event—what happened to prices within the affected blocks relative to prices in unaffected blocks—ignoring, for example, other cross-area comparisons of price levels not driven by the event.

Prof. Rysman does not use either instrumental variables or event studies to limit the variation that he relies on to draw his inference of a causal relationship between number of competitors and prices. Rather, he pursues a "fixed effects" approach. To be clear, just like the methods described above, fixed effects estimation is a method to limit the sources of variation relied on in measuring the relationship between number of competitors and prices. In that sense, Prof. Rysman is being careful in his approach. The problem, as explained in more detail below, is that the way the fixed effect estimator selects which variation to rely on is not driven by whether the variation is or is not exogenous. As such, the variation in number of competitors

used to draw inferences under this approach is not free of endogeneity and, consequently, this approach is not a solution to the problem at hand.

What a fixed effect estimator does is rely only on variation "within" a given geographic unit, not across those geographic units. So, for example, when Prof. Rysman uses census tract fixed effects, he is *completely* controlling for *all* variation in the number of competitors and prices across different census tracts and relying *only* on the variation in number of competitors and prices across census blocks within each census tract. It follows that if census tract 1 has more competitors and higher prices than census tract 2 (or any other such relationship), a regression using census tract fixed effects draws *no* inference from that fact. Rather, it only draws inferences from differences in the number of competitors and prices across different census blocks *within the same census tract*. The same logic goes for county fixed effects, except that in this case variation across all blocks within a given county (and thus implicitly across census tracts that make up the same county) is used to draw inferences.

The problem for Prof. Rysman is that there is no reason to believe that variation in number of competitors across blocks within a tract or county is more exogenous—that is, less correlated with underlying economic conditions—than variation across tracts or counties. So isolating the "within tract" or "within county" variation, such as his fixed effect estimator does, simply does not solve the endogeneity problem. As a matter of economics, the fact that a given census block within a tract or county has more competitors than another very likely *is* driven by variation in the cost and demand conditions across the census blocks within the tract or county. Prof. Rysman provides no reason to believe it is not and thus no reason to believe the within tract/county variation used by his approach in any way solves the endogeneity problem. Absent

this, the approach cannot be used to draw valid inferences about the effect of competition on prices and thus cannot be used to draw valid inferences about market power.

There is not even any basis to conclude that the inclusion of fixed effects helps to "reduce" the endogeneity problem; it may well make it worse. That is, the use of fixed effects may tend to isolate and rely on the endogenous variation, rather than the exogenous variation. To see this, consider the example above, where the source of exogenous variation comes from the fact that a key CLEC operates in certain states but not others. As described above, a valid instrumental variables strategy in this case, would rely *only* on the cross-state variation between states with and without that CLEC and would *not* rely on within state (or county or tract) variation where variation in the number of competitors would be correlated with localized economic conditions.

More generally, the problem with using fixed effects to attempt to solve the endogeneity problem in this context can be seen via analogy to a "signal-to-noise" problem. Suppose there is a broadcast "sound feed" with a true "signal" that one wishes to hear but also a great deal of "noise" around the signal that makes it hard to decipher the true signal. One would like to design a filter that would eliminate the noise and preserve just the signal. This is exactly what the instrumental variable or event study approaches do—they filter out the "noise" of endogenous variation (which confounds the causal effect of more competitors with the effect of underlying economic conditions) to focus only on the "signal" of exogenous variation (which allows the causal relationship to be measured). In contrast, fixed effect estimators filter out cross-county or cross-tract variation to focus only on variation across census blocks within a county or tract. The problem with this approach is that there is no basis to say that the cross-tract or cross-county variation is endogenous while the within-tract or within-county variation is exogenous. Instead,

both may contain some "signal" and some "noise" and filtering down to within-county or within-tract variation does not isolate the signal, and could even *reduce* the ratio of signal to noise.

In his paper, Prof. Rysman suggests that fixed effects may largely address the endogeneity (or what he refers to as "unobserved heterogeneity") problem because they control for much of the cost heterogeneity across census blocks.[19] That is, relative to a comparison of all census blocks, a comparison of census blocks just within county or tract leaves less heterogeneity (that is, variation) in costs (and, more generally, in the underlying economic conditions). While this is surely true, it misses the point. The total amount of uncontrolled-for cost heterogeneity is not the key issue; the key issue is what is driving the observed variation in the number of competitors. Adding county or tract "fixed effects" both reduces the amount of variation in costs (and other underlying economic factors) *and* reduces the variation in the number of competitors used in estimation. That is, it reduces *both* the signal and the noise. The relevant question is whether the variation in number of competitors that remains after applying the fixed effect filter (the within tract/county variation) is exogenous or whether it is endogenous, meaning driven by the differences in cost or other economic conditions across census blocks within tract/county.

Nothing in Prof. Rysman's report provides any reason why the variation in number of competitors across blocks within tract/county would be exogenous. Nor does it explain why removing cross tract/county variation using fixed effects amounts to throwing away more noise than signal, thereby moving in the right direction. Instead, this approach simply relies on a subset of the overall variation in the number of competitors without any basis to say it is the "right" subset from which to draw causal inferences.

[19] *See* Rysman White Paper pp. 227, 232.

To be clear, while there *are* situations in which using fixed effects may be an important part of a solution to the endogeneity problem, they do not apply here. For example, when implementing the event study approach described above, using data that include multiple observations on the *same* census block over time, one might include census block (or otherwise narrow) fixed effects so as to measure effects based only on changes *within* a census block over time. In this case, the model would be set up to measure effects based on *changes* over time within census blocks affected by the event versus changes in those blocks not affected by the event, thus filtering out all (cross-block) variation so as to learn only from the "signal" arising from exogenous event. But that is not what Prof. Rysman's fixed effects do—instead they are applied to data that contain no time series dimension and are set at a broader (tract or county) level of geography, thus simply focusing on one form (within county or tract) source of cross-sectional variation rather than another (cross county or cross tract) form of cross-sectional variation, with no reason to believe this solves the endogeneity problem.

At its core, the problem here is not primarily with Prof. Rysman's modeling approach as it is with the available data, which contain no time series dimension on which to conduct an event study and no obvious sources of exogenous cross-sectional variation in the number of competitors. As such, the data do not permit one to draw causal inferences about the effect of the number of competitors on prices. That is why, in our submissions, we have relied on an approach that uses economic theory—based on the importance of sunk facilities and the bidding characteristics of the market—to infer that census block with nearby competitive fiber installations are likely to be competitive, and then relied on the cross-sectional data for the purpose to which it is well suited, namely measuring the extent of competition by census block and summarizing this nationwide.

For all of these reasons (and the additional reasons set forth below), while the Commission's 2012 NPRM sought comment on the types of regressions Prof. Rysman has performed to assess market power for BDS, the data set collected by the Commission lacks the information needed to implement regressions that would draw useful conclusions about the relationship between the number of providers in a market and prices in that market. Specifically, the data collected do not allow us—or Dr. Rysman, or any other analyst—to assess whether pricing differentials are caused by the number of competitors in the market, or, alternatively, whether another factor, such as cost or demand conditions, is causing both pricing differentials and relative lack of entry in certain markets.

b. The Pricing Data Used In The Regressions Produce Biased Regression Results.

In addition to the endogeneity issue, we have identified additional problems with the regressions presented by Prof. Rysman. As with the endogeneity problem, described above, these problems are not the fault of Prof. Rysman, but are caused by the fact that the underlying data are not up to the task he was given. Thus, despite his efforts, his regression analysis cannot support an inference of ILEC market power.

The regressions presented by Prof. Rysman attempt to measure the relationship between DS1 and DS3 prices in each building and the number of competitors in the same building or nearby to the building. To estimate accurate and unbiased coefficients, it is necessary to accurately measure prices paid for special access services at each building. However, it is clear that the pricing data used in the regressions are invalid, and thus likely produced biased regression results.

First, the summary metrics for the underlying pricing data reported by Prof. Rysman indicate that there are significant errors (either flawed data or measurement error) in the prices

used in the regressions. For example, the maximum price for a DS1 used in the regressions was $116,353 per month.[20] This observation is clearly incorrect. We understand that DS1 circuits cost between $200 and $400. Similarly, the maximum price for DS3 circuits used in the analyses is $596,711.[21] This amount is also implausibly large. At a minimum, such outliers will have undue influence on Prof. Rysman's estimated regression coefficients and distort the results.

Second, the pricing data used in the regressions appears to systematically omit lower priced configurations. It appears that the programs used to construct prices for DS1 and DS3 circuits omit circuits that do not use the same bandwidth for all of the underlying elements (*e.g.*, channel termination, local transport). As a result, lower cost configurations that provide DS1 or DS3 services over multiplexed fiber or other facilities are excluded from the analyses. The *systematic* exclusion of prices for a particular type of circuit from the regression samples run the risk of biased results that cannot legitimately be used to draw conclusions about the relationship between prices and the number of competitive providers.

Third, the DS1 and DS3 pricing data are not normalized to ensure apples-to-apples comparisons. DS1 and DS3 circuits can be configured in multiple ways that result in differential pricing, independent of the number of competitive providers. A simple example illustrates the problem. Consider two buildings, both with a single DS1 circuit. The DS1 circuit in one building requires substantially more mileage and is therefore priced ten percent higher than the DS1 circuit at the other building. If there is one competitive provider at the higher cost building and two providers at the lower cost building, the regressions presented by Prof. Rysman will find that prices at the building with two competitors are ten percent lower. But that does not mean

[20] *See* Rysman White Paper, Attachment 3.

[21] *Id.*

that the extra competitors caused the price difference; the price difference is actually caused by the need for more mileage. Thus, the mere fact that the regressions presented by Prof. Rysman can show a negative correlation between price and the number of competitors could just as easily reflect that there tend to be more competitors where required mileage is less, not that ILECs lower prices in response to CLEC competition. This example illustrates how failure to adjust for differences in the product, coupled with the endogeneity of entry, can create or amplify bias in estimates of the competition effect.

Fourth, the prices used in the regressions exclude prices for a large portion of the buildings with BDS demand. The ILEC circuits appear in the 2013 SADC only if it is possible to compute average monthly revenue derived from that circuit. However, as we have previously demonstrated, 42% of all buildings identified by the FCC are composed of one or more locations without billing data. As a result, the regressions reported by Prof. Rysman are based on an incomplete picture of actual prices at buildings with competitors' connections. The principal concern here is that the selection of missing observations, and hence the source of that mismeasurement, is not random. As we have previously demonstrated, the missing billing information (and hence pricing information) does, in fact, vary systematically by region and by provider.[22]

Fifth, the regressions presented in the Rysman White Paper rely on "standard error" measurement that does not allow for the fact that, in the BDS marketplace, unmeasured factors that determine ILEC pricing are likely to be correlated within each larger area. Prof. Rysman correctly acknowledges this issue and raises the question as to whether a more accurate approach

[22] *See* Declaration of Mark Israel, Daniel Rubinfeld and Glenn Woroch, *Special Access Rates for Price Cap Local Exchange Carriers; AT&T Corp. Petition for Rulemaking to Reform Regulation of Incumbent Local Exchange Carrier Rates for Interstate Special Access Services*, WC Docket No. 05-25, RM-10593, at ¶¶ 27-30 (filed Feb. 19, 2016).

would be to compute standard errors of the regression coefficients by "clustering" observations within each geographic area—a method that allows for, but does not force, correlation within the unobservable factors within each geographic areas—but he does not implement this approach.[23]

We re-estimated Prof. Rysman's various models calling for standard errors to be clustered on the census tract or county when the regression includes fixed effects for tract or county, respectively. As is always the case, this technique does not affect the estimated coefficients, but the clustered standard errors are larger than those computed by Prof. Rysman since they reflect the correlation within each geographic area. Using this approach we find that the effects of competition on ILEC DS3 prices are no longer statistically significant, whether the regressions are done for tracts or for counties.

c. Even If the Regression Results Reported by Rysman are Accurate, They Do Not Establish That ILECs Have Significant Market Power Requiring Further Regulatory Intervention.

Even accepting the results in the regressions as accurate, those results show that the impact of competition on DS1 prices is generally very small. For example, Table 14 in the Rysman White Paper shows that a competitor with a connection to a building will cause the ILEC to reduce prices by only 3.2%. We agree with Prof. Rysman that this figure is "not especially large by the standards of competition analysis."[24] We find no valid basis to conclude that ILECs exercise significant market power for DS1 services based on regressions that indicate

[23] Rysman White Paper p. 233 ("There are basic statistical issues which would be interesting to explore, such as the use of clustered standard errors (I use robust standard errors in this paper) . . . .").

[24] *Id*. pp. 228-29.

that ILECs may lower prices by 3.2% or less, especially given the substantial caveats in interpreting these regressions, laid out throughout this paper.[25]

Even if Prof. Rysman's analysis did not overstate the likely price impacts, the small effects that he shows are insufficient to document a problem that warrants regulatory intervention. Any new regulations come with their own risk. As just one example, regulations that require ILECs to reduce prices for DS1 and DS3 services risk substantially undermining incentives for customers to migrate to next generation, and more efficient, Ethernet offerings. Further, reduced demand for Ethernet will result in less investment in Ethernet facilities and upward pricing pressure for those services. Bearing such risks for the purpose of countering ILEC prices that are at most 3.2% above competitive levels in some areas, in our view, is not an economically sound regulatory strategy.

2. The Other Evidence Of Market Power Referred To In The *FNPRM* Is Fundamentally Flawed.

For the reasons set forth below, we also find no merit to the other evidence of market power identified in the *FNPRM*.

Price Caps Headroom. The *FNPRM* indicates that ILECs have a small amount of "headroom" (in percentage terms) under the price caps for DS1 and DS3 services, and suggests "the fact that the price capped incumbent LECs have kept their prices at the top of the cap is additional evidence of market power."[26] We disagree. The mere fact that an ILEC's rates are at or near the price cap cannot by itself establish that ILECs exercise market power. That conclusion could be drawn only if it were also demonstrated that the current caps are set above

[25] As explained above, using proper standard error measurements, the regressions show no evidence that ILECs reduce prices for DS3 services in response to competition, thus refuting the hypothesis that ILECs exercise market power for DS3 services.

[26] *FNPRM* ¶ 239.

competitive levels. If, on the contrary, the current caps are set below competitive levels, the fact that ILECs are at or near those caps says nothing about market power. We are not aware of any evidence that the current price caps are set at above-competitive levels today.

Concentration. The *FNPRM* contains a heading that states: "Concentration by Any Measure Appears High in This Industry."[27] We disagree. The main metric used to support this assertion is that ILECs are the only provider to about 77% of buildings with BDS demand. But that metric fails to account for the fact that building-connection market shares provide a distorted view of competition in the BDS marketplace. Rather, competitors deploy networks in areas with BDS demand, compete for customers in those areas (typically within about a half mile of their networks), and then connect to the buildings where they win customers. This means that competition occurs not only in buildings where competitors have already deployed connections, but also in buildings within about a half mile of their networks. As we have shown, most buildings with BDS demand have multiple options for BDS either in their building or within close proximity.

Even if the building-connection metrics were relevant, the data presented in the *FNPRM* show that the majority of buildings served by ILECs are also served by at least two facilities-based competitors. First, the above 77% metric excludes cable HFC facilities. As we explained, cable companies offer Ethernet with service level commitments using their HFC facilities, and those services fall squarely within the Commission's proposed definition of BDS. When cable HFC building connections are facilities are taken into account, the portion of ILEC-only buildings falls to only about 14%, according to the tables presented in the *FNPRM*.[28]

[27] *Id.* ¶¶ 216-23.

[28] *See id.* ¶ 221, Table 4.

Barriers to Entry. The *FNPRM* asks about claims made by CLECs that they face barriers to entry for DS1 and DS3 services.[29] Our review of the evidence submitted in response the Commission's 2013 data collections indicates that CLECs are not impeded in their ability to compete for customers with DS1- and DS3-level demand. The 2013 SADC shows that half of the buildings with a CLEC connection have less than 37 Mbps in total bandwidth per building (after excluding Unbundled Network Element ("UNE") connections).[30] CLECs clearly have sufficient economic incentives to build out to buildings with relatively low demand in terms of bandwidth.

ILEC Affiliate CLEC Build Out. The *FNPRM* states that ILEC-affiliated CLECs "have engaged in limited facilities-based investment relative to certain other [CLECs] and in some areas have avoided the use of UNEs."[31] The *FNPRM* does not refer to evidence supporting this statement. Nor does the *FNPRM* offer an explanation why, even if true, this observation constitutes "direct evidence" that ILECs exercise market power.

The assertion that ILEC-affiliated CLECs "have not engaged in significant out-of-region facilities-based investment"[32] appears to be based on the metric reported by Prof. Rysman that ILEC-affiliated CLECs account for less than 7% of all connections, whereas non-affiliated CLECs account for 25% of all connections. But this comparison is invalid. ILEC-affiliated CLECs do not operate in their corresponding ILEC regions, whereas other CLECs often operate nationwide.

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[29] *See id.* ¶¶ 224-29.

[30] We define a connection as a location ID reported in Table II.A.4 or II.B.3 Bandwidth figures were calculated using the total bandwidth sold field in these tables. Sometimes filers reported bandwidth of a connection to be zero.

[31] *See FNPRM* ¶ 243.

[32] *See id.*

In addition, even if it is true that ILEC-affiliated CLECs rely on purchasing BDS or UNE connections from the ILEC rather than their own facilities actually undermines any hypothesis that ILECs exercise market power. As explained in the *FNPRM*, ILEC-affiliated CLECs are among the larger and more successful CLECs, something that would be unlikely if the BDS service they purchase were prices at supra-competitive levels.

III. THE RECORD CONTAINS NO VALID EVIDENCE OF MARKET POWER FOR ETHERNET SERVICES.

We understand that the Commission has asked whether the data supports regulating Ethernet services. The evidence we have reviewed in this proceeding indicates that the Ethernet marketplace—for all speeds—is highly competitive.

There are no "incumbent" Ethernet providers. No provider (including the ILECs) had a pre-existing Ethernet network when those services were first deployed, and thus all providers were starting without incumbent advantages. During the past several years, numerous providers, including ILECs, CLECs, cable companies, and others, have invested billions of dollars to deploy Ethernet services. At present, dozens of non-ILEC providers vie for the supply of Ethernet services, and a recent study shows that no provider has a port share that exceeds one-fifth of total Ethernet services.[33] That study confirms that there are nine providers with port shares of four percent or more, including three CLECs, and three of the nation's largest cable companies.[34] A CLEC is the second largest Ethernet provider in the U.S. measured by port share;[35] Time Warner Cable has been described as a "significant mover in the league"; and

[33] Vertical Systems Group, ENS Research Program (2015).

[34] Vertical Systems Group, *2015 U.S. Carrier Ethernet LEADERBOARD* (Feb. 25, 2016), http://www.verticalsystems.com/vsglb/2015-u-s-carrier-ethernet-leaderboard/.

[35] *Id.*

Comcast "continues to expand its fiber and Ethernet reach."[36] Other providers (those with port shares under 4%) have a combined port share in excess of 20%.[37]

The 2013 data collected by the Commission further confirm that no Ethernet provider has market power. The CLECs' consultants' analyses of those data find that non-ILECs' share for services ranging from 50 Mbps and higher (which includes Ethernet services), as of 2013, was almost 50% measured by circuit counts and over 41% measured by revenue.[38] Further, non-ILECs have continued to expand rapidly. For example, as we have shown, "[c]omparing January 2013 to December 2013 [billing information from the 2013 Data Collection], the bandwidth of Ethernet circuits provisioned by ILECs and competitive providers grew at 5.3 percent and 31.6 percent, respectively."[39] Such asymmetric growth further undermines any claim that ILEC's have sustainable market power in Ethernet services.

In addition, to the extent that the Commission chooses to rely on the type of regressions in the Rysman White Paper, we note that Prof. Rysman performed regression analyses specifically to test high bandwidth services (above 50 Mbps), which includes a significant amount of Ethernet, and found no evidence of ILEC market power for those services.[40] As for lower-bandwidth Ethernet services, Prof. Rysman reports: "[d]ue to timing constraints, the data

[36] Zacks Equity Research, *Cable MSOs Challenge Telecom Providers in Ethernet Market* (Mar. 10, 2016), https://www.zacks.com/stock/news/210120/cable-msos-challenge-telecom-providers-in-ethernet-market (noting that Time Warner Cable "gained 14.4% in business revenues in 2015 driven by increases in high-speed data and voice subscribers" and Comcast "registered 20% growth year over year in 2015").

[37] Vertical Systems Group, ENS Research Program (2015).

[38] Declaration of William P. Zarakas and Susan M. Gately, Appendix C, Tables 2 & 3 ("Zarakas-Gately Decl."), attached to the Comments of Sprint Corp., *Special Access Rates for Price Cap Local Exchange Carriers, AT&T Corp. Petition for Rulemaking to Reform Regulation of Incumbent Local Exchange Carrier Rates for Interstate Special Access Services*, WC Docket No. 05-25, RM-10593 (filed Jan. 27, 2016).

[39] *See* IRW White Paper p. 24.

[40] Rysman White Paper p. 212; *FNPRM* ¶ 244.

set analyzed did not include packet-based services with bandwidths of 45 Mbps and less."[41] We have estimated regressions using the same programs and data that he used, and those results show that ILEC prices for packet based services do not decline in response to greater numbers of competitors, which means that, by their own logic, the regressions do not find ILEC market power for these lower bandwidth services.

Specifically, we selected ILEC circuits that were packet-based and that had a bandwidth less than 45 Mbps.[42] Using the resulting sample of about 40,000 circuits, we estimated Prof. Rysman's "base model" which includes an indicator for one or more competitors with a special access connection in the same block (Table 14). The regression estimated a 4.1% *increase* in ILEC price of this type of circuit when there was a facilities competitor in the block, and that increase was highly statistically significant. If one were to adopt Prof. Rysman's methodology, this result would reject a claim that ILECs exercise market power for low-band, packet-based circuits.

At most, the *FNPRM* appears to simply assume market power for Ethernet services below 45 Mbps based on its assumption of ILEC market power for DS1 and DS3 services. However, even if there were valid evidence that ILECs exercise market power for DS1 and DS3 services, it does not follow that ILECs exercise market power over Ethernet services. And as noted above, actual regressions that include Ethernet services show that such bootstrapping is invalid here.

[41] Rysman White Paper p. 226, n.31.

[42] In his regressions for High-Band Services, Prof. Rysman included circuits that were classified as "Other Circuit Based Dedicated Services." We do not include those observations; we limit the estimation sample to packet-based circuits.

IV. A DATA-DRIVEN COMPETITIVE MARKET TEST THAT IS GEOGRAPHICALLY GRANULAR AND SIMPLE TO ADMINISTER.

The *FNPRM* asks the parties to suggest a simple and administrable CMT that could be applied on geographic areas smaller than MSAs to distinguish between areas where there is competition for lower bandwidth services—*i.e.*, services of 45 Mbps or lower—and those areas where competition is lacking for these lower-bandwidth services. We have developed a simple competitive market test that is easy to administer and that accurately identifies areas where there is substantial actual competition for BDS services according to the 2013 SADC.

Based on extensive analyses of the 2013 SADC, we find that the following CMT accurately predicts areas where ILECs clearly face competition:

> A Census Tract is "competitive" if two or more facilities-based providers are located within 2,000 feet of the census tract.[43]

Under this test, a facilities-based provider is one that meets one of three conditions: (i) the provider reports a BDS connection of any kind excluding any connections provided using either a UNE or Unbundled Copper Loop ("UCL") in the census tract; (ii) the provider reports a fiber strand or network node within 2,000 feet of a building with a BDS connection that is located in the census tract; or (iii) the provider is a cable operator that reports providing DOCSIS 3.0 service over HFC in a census block sub-region of the tract. The competitors are summed up across all areas in the census tract after removing any duplication of providers showing up in more than one census block in that tract. We provide a detailed explanation for how we conducted these analyses in Appendix A to this paper.

[43] As a technical matter, we determined whether two or more provider networks were within 2,000 feet of one or more buildings located in each census tract. If so, we declared the census tract to be competitive.

A. The 2013 Data Confirm That Virtually All BDS Customers In Census Tracts That Pass Our Proposed CMT Have Multiple Facilities-Based Options.

In this section, we demonstrate that: (i) our proposed CMT accurately identifies census tracts where virtually all buildings, bandwidth, and business establishments have access to two or more providers; (ii) our approach provides for a reasonable level of geographic granularity; and (iii) our approach should be easy to administer.

1. Accuracy of CMT in Predicting Competition.

We used the 2013 SADC, supplemented with cable company HFC coverage from the National Broadband Map dataset, to identify all census tracts that would pass our proposed competitive market test. We then used these same data to determine the portion of buildings served by ILECs and the portion of demand served by ILECs in these census tracts that have at least one competitive alternative within 2,000 feet of the building. We also estimated the overall portion of business establishments located in areas within census tracts that pass our proposed CMT. These analyses confirm that, in the census tracts that are designated as "competitive" using our proposed CMT, there are at least two competing provider networks—providing validation for our CMT.

Using the 2013 data collection, supplemented with cable HFC data from the National Broadband Map, we have confirmed that about 92% of all buildings served by ILECs in the census tracts that pass our proposed CMT are within 2,000 feet of two or more provider networks. These buildings account for about 93% of all bandwidth in those census tracts. Furthermore, the constituent census blocks containing these buildings contain more than 96% of

all business establishments found in census blocks with an ILEC providing special access service and within census tracts passing the CMT.[44] The results are reported in Table 1.

TABLE 1. ILEC Metrics for Census Tracts That Pass the Proposed CMT

Percent of ILEC Buildings Within 2,000 Feet Of At Least Two Providers' Networks	Percent of ILEC Bandwidth Located In Buildings Within 2,000 Feet Of At Least Two Providers' Networks	Percent of ILEC Connections Located In Buildings Within 2,000 Feet Of At Least Two Providers' Networks	Percent Of Business Establishments In Areas With At Least Two Providers' Networks[45]
91.5%	92.5%	91.5%	96.3%

Because most ILEC buildings and demand contained in census tracts that pass our proposed CMT are within 2,000 feet of at least two provider networks, it follows that BDS services at all speeds, including sub-50 Mbps BDS, are also subject to competition in those census tracts. Nonetheless, we took a closer look at the coverage of the sub-50 Mbps marketplace. For each census tract that passes our proposed CMT, we used the 2013 SADC, supplemented with cable HFC data from the National Broadband Map, to determine the portion of ILEC buildings with sub-50 Mbps BDS demand that are within 2,000 feet of at least two provider networks, and the portion of ILEC sub-50 Mbps demand that is in these buildings. This exercise confirmed that more than 90% of the buildings where ILECs have sub-50 Mbps

[44] We note that, for the vast majority the census tracts that pass our CMT, *all* ILEC buildings are within 2,000 feet of at least two providers' networks.

[45] Establishment data are at the census block level. If a census tract passes the CMT, all establishments associated with blocks within the tract are factored into the denominator (and which have a connection reported in the SADC). Establishments in blocks with at least one building with two or more competitors within 2,000 feet are counted in the numerator (and which have a connection reported in the SADC).

connections are within 2,000 feet of at least one other provider's network. These data further show that more than 90% of ILEC sub-50 Mbps demand (*i.e.*, bandwidth) is located in buildings with at least one other provider within 2,000 feet. The results are reported in Table 2.

TABLE 2. Sub-50 Mbps ILEC Metrics for Census Tracts That Pass the Proposed CMT

Percent of ILEC Buildings With Sub-50 Mbps Connections Within 2,000 Feet Of At Least Two Providers' Networks	Percent of ILEC Bandwidth Located In Buildings With Sub-50 Mbps Connections Within 2,000 Feet Of At Least Two Providers' Networks	Percent of ILEC Connections Located In Buildings With Sub-50 Mbps Within 2,000 Feet Of At Least Two Providers' Networks	Percent Of Business Establishments In Areas With At Least Providers' Networks
91.3%	90.7%	91.6%	96.2%

The metrics reported in Tables 1 and 2 demonstrate that our proposed CMT accurately identifies census tracts where most ILEC buildings and most BDS demand are subject to competition. It is important to recognize, moreover, that these metrics likely *understate* the true extent of competition in the census tracts that pass our proposed CMT.

Foremost, all of the above metrics are understated because they are based on the footprints of providers' networks as of 2013. They do not reflect the substantial facilities-based expansions that have occurred since then. In addition, these metrics do not account for UNE-based competition. As the *FNPRM* correctly recognizes, "it is important to account for the effects of UNE competition,"[46] because competitors use UNEs purchased from ILECs at cost-

[46] *FNPRM* ¶ 228.

based TELRIC levels and use those facilities to compete against ILECs for BDS customers. If we update the CMT to account for UNE-based competition, we find that about 92% of all buildings served by ILECs in the census tracts that pass our proposed CMT are within 2,000 feet of two or more provider networks. These buildings account for about 94% of all bandwidth in those census tracts. Furthermore, the constituent census blocks in the census tracts where at least two providers have networks within 2,000 feet of at least one building contain more than 96% of all business establishments.

2. Geographic Granularity.

The Commission's existing regulatory regime divides competitive and non-competitive areas for BDS at the MSA-level. There were 381 MSAs in the U.S. as of 2013.[47] Census tracts are much smaller than MSAs: there are about 74,000 census tracts in the U.S., and the median census tract is only about 1.5 miles across. And, as we have demonstrated, the census tracts that pass our proposed CMT are uniformly competitive, with most (more than 90%) of buildings and bandwidth subject to competition from two or more providers.

We agree with the discussion in the *FNPRM* that attempting to regulate at even more geographically granular levels, such as the census block or building level would likely not add value and would likely not be administratively practical.[48] Regulation at such granular levels would be much more likely to lead to an even greater patchwork of regulations within small geographic areas, raising far more challenges in terms of regulatory administration and ILEC implementation and compliance.

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[47] Office of Management and Budget, "Revised Delineations of Metropolitan Statistical Areas, Micropolitan Statistical Areas, and Combined Statistical Areas, and Guidance on Uses of the Delineations of These Areas," OMB Bulletin No. 13-01, Feb. 28, 2013, *available at* https://www.whitehouse.gov/sites/default/files/omb/bulletins/2013/b13-01.pdf.

[48] *See FNPRM* ¶ 289.

3. Administrability.

Our proposed test should be relatively straightforward to implement. The Commission could use the 2013 data, supplemented with data for cable company HFC facilities, to determine which census tracts satisfy this test. In the future, the Commission would have to collect only information from industry participants identifying the census tracts in which they have facilities and the distances of their networks from other census tracts.

B. Product Market Definition and Customer Classes

In this section we address the following two issues raised in the *FNPRM*: (1) the definition of "product market" for the CMT test, and (2) whether CMT should account for different "classes" of customers.

1. The BDS Product Market.

Our proposed CMT accounts for all facilities capable of providing broadband services to businesses. These facilities include copper, fiber, HFC, and fixed wireless facilities (to the extent reported in the 2013 SADC) but exclude connections provided using UNEs or UCLs.

The *FNPRM* asks whether the CMT should instead count only facilities used to provide services that include certain levels of performance commitments. In particular, the *FNPRM* proposes to define BDS as a service that "transports data between two or more designated point at a rate of at least 1.5 Mbps in both directions (upstream/downstream) with prescribed performance requirements that typically include bandwidth, reliability, latency, jitter, and/or packet loss."[49] The *FNPRM* states that this definition "does not include 'best effort' services, *e.g.*, mass market BIAS such as DSL and cable modem broadband access."[50]

[49] *Id.* ¶ 279.

[50] *Id.*

In our view, this definition is too vague to be incorporated into a CMT because it does not provide sufficient guidance as to which combination of performance metrics must be offered, or at what levels they must be offered (*e.g.*, 99.99%, 99.00%, 95.00%).

Nor is there any economic basis for drawing these lines. As we have previously shown, customers of business data services choose the best combination of price and performance commitments that meet their needs, and providers compete for those customers by fine tuning the combination of price and performance metrics they offer.[51] One provider may offer a high price and a wide variety of high performance commitments, while another might offer a much lower price combined with lower commitments. Both providers are aggressively competing by designing offers that they believe are most desired by their customers.

These distinctions are especially inappropriate when the underlying facilities of competitors offering different performance commitments are capable of offering the same performance commitments. If two providers have deployed fiber facilities in an area, but have chosen to use those facilities to offer business services with different combinations of price and performance commitments, these providers are competing. If one provider is more successful, the other provider could easily revise its offering using its existing facilities.

In addition, as an economic matter, any attempt to divide the market by the performance metrics offered would create a substantial risk of reduced investment and competition for business broadband services. Such line drawing would give providers strong incentives to offer services with performance commitments that fall just below the line that would trigger regulation. The result would be less investment, less competition, and lower quality of services.

[51] IRW White Paper pp. 8-9.

Based on our review of the evidence in the record, we also disagree with the proposal to exclude "best efforts" services offered by cable companies over their HFC facilities from the definition of BDS for the purposes of the CMT. Setting aside the fact that these same facilities are also used to offer Ethernet services, which appears to fall within the definition of BDS for the purposes of the CMT according to the *FNPRM*, the evidence in the record that we have reviewed establishes that "best efforts" should be included as a BDS. Best efforts services offered by cable companies typically offer speeds of 100 Mbps or more, which is far greater than the speeds available from DS1 and DS3 services, and these best efforts services are often offered at prices well below those of DS1 and DS3 services. The record evidence we have reviewed shows that many customers view the higher speed and lower price as a justifiable trade-off for lower performance commitments. In addition, Prof. Rysman notes that "some customers may view best-efforts broadband services as a viable alternative" to services that include performance commitments.[52]

The record evidence shows for example, that, for the thirteen month period from November 2014 through November 2015, a very substantial portion of AT&T's competitive losses were to cable companies and a significant portion of those losses were to best efforts cable services.[53] CenturyLink reports that it "'competes against all the major cable companies, including but not limited to Comcast, Cox, Time Warner Cable, Charter, and Bright House.'"[54]

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[52] Rysman White Paper p. 218.

[53] Reply Comments of AT&T Inc., *Special Access Rates for Price Cap Local Exchange Carriers, AT&T Corp. Petition for Rulemaking to Reform Regulation of Incumbent Local Exchange Carrier Rates for Interstate Special Access Services*, WC Docket No. 05-25, RM-10593, at 26-27 (filed Feb. 19, 2016).

[54] Reply Comments of CenturyLink, *Special Access Rates for Price Cap Local Exchange Carriers, AT&T Corp. Petition for Rulemaking to Reform Regulation of Incumbent Local Exchange Carrier Rates for Interstate Special Access Services*, WC Docket No. 05-25, RM-10593, at 9-10 (filed Feb. 19, 2016) ("CenturyLink Reply") (quoting Declaration of Julie Brown and David Williams, attached as Exhibit 1 to the CenturyLink Reply).

XO's Director of Product Analytics admits that XO is "regularly competing" against cable companies for small and medium sized businesses, that it "loses" small and medium-sized customers "to [cable] companies offering Best Efforts Internet," and that it has developed "products to this group of customers."[55] Windstream's website advertises its "Ethernet Internet" service (with a 99.99% uptime guarantee) as a substitute for best efforts cable.[56] TDS has indicated that the vast majority of customers' purchases lower-bandwidth services from TDS and that these customers have been "downgrading to best efforts broadband internet access services for cost savings."[57]

AT&T and other ILECs have also demonstrated that they are now significant purchasers of cable company best efforts services as inputs to the data services they sell to retail customers. AT&T for example, has explained that it currently has contracts with **[BEGIN HIGHLY CONFIDENTIAL INFORMATION]** [redacted] **[END HIGHLY CONFIDENTIAL INFORMATION]** for the purchase of HFC-based services outside of AT&T's ILEC footprint, and that it has certified these services for use as inputs to AT&T's flagship MIS, VPN and backhaul services.[58]

[55] Declaration of James A. Anderson ¶ 33 ("Anderson Decl."), attached to Comments of XO Communications, LLC On The Further Notice of Proposed Rulemaking, *Special Access Rates for Price Cap Local Exchange Carriers, AT&T Corp. Petition for Rulemaking to Reform Regulation of Incumbent Local Exchange Carrier Rates for Interstate Special Access Services*, WC Docket No. 05-25, RM-10593 (filed Jan. 27, 2016).

[56] *See* Windstream, "Ethernet Internet," http://www.windstreambusieness.com/products/enterprise-network-servides/dedicated-internet-services/ethernet-internet.

[57] Declaration of James Butman On Behalf of TDS Telecommunications Corp. ¶¶ 5, 15, attached to *Ex Parte* Letter from Thomas Jones (TDS) to Marlene H. Dortch (FCC), *Special Access Rates for Price Cap Local Exchange Carriers, AT&T Corp. Petition for Rulemaking to Reform Regulation of Incumbent Local Exchange Carrier Rates for Interstate Special Access Services, Technology Transitions, AT&T Petition to Launch a Proceeding Concerning the TDM-to-IP Transition*, WC Docket No. 05-25, RM-10593, GN Docket Nos. 13-5, 12-353 (filed Mar. 26, 2015).

[58] AT&T Notice of *Ex Parte* Presentation, *Special Access Rates for Price Cap Local Exchange Carriers, AT&T Corp. Petition for Rulemaking to Reform Regulation of Incumbent Local Exchange Carrier Rates for Interstate Special Access Services*, WC Docket No. 05-25, RM-10593, at 7-8 (filed Mar. 21, 2016) ("AT&T 3/21/16 *Ex Parte*").

Similarly, CenturyLink has demonstrated that "as a buyer of access, CenturyLink has entered into various arrangements with cable companies, and has, over time, increased the volume of HFC-based services it acquires from them because of the value proposition these services offer."[59]

Also, recent sales figures from cable companies reveal their success in winning customers that might otherwise purchase DS1 and DS3 level services. For example, **[BEGIN HIGHLY CONFIDENTIAL]** [redacted] **[END HIGHLY CONFIDENTIAL]** increase in revenue for its best efforts Business Internet broadband services from 2014-2015.[60] **[BEGIN HIGHLY CONFIDENTIAL]** [redacted] **[END HIGHLY CONFIDENTIAL]** increase in revenues from 2014 to 2015 for its Business Internet Access ("BIA") product, which is a best efforts Internet access service.[61] These substantial increases in sales can only come from customers that would otherwise have purchased services offered by ILECs and CLECs, such as DS1 and DS3 level services.

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[59] CenturyLink Reply pp. 11-12. Further, cable companies themselves and industry analysts have emphasized the substitutability of cable best efforts broadband services for legacy DS1 and DS3 services. Comcast's President has stated that "100 Mbps service is ideal for data-intensive businesses that need this kind of speed and want an alternative to slower, more expensive T1 lines." Press Release, Comcast Corp., Comcast Launches 100 Mbps High-Speed Internet Service for Business in the Twin Cities (Sep. 8, 2009) *available at* http://corporate.comcast.com/news-information/news-feed/comcast-launches-100-mbps-high-speed-internet-service-for-businesses-in-the-twin-cities. *See also, e.g.*, Press Release, Charter Communications, Charter Business Customers Stay on the Leading Edge of Internet Speed with third Free Speed Increase for Commercial Customers (Dec. 1, 2011), *available at* https://newsroom.charter.com/press-releases/2011/charter-business-customers-stay-on-the-leading-edge-of-internet-speed-with-third-free-speed-increase-for-commercial-customers/ ("*Charter Business Internet Essentials16*, with downstream speeds of 16 megabits per second (Mbps) and upstream speeds of 2 Mbps, will increase to up to 20 Mbps downstream and 3 Mbps upstream – . . . more than 13 times faster than T1.").

[60] **[BEGIN HIGHLY CONFIDENTIAL]** [redacted] **[END HIGHLY CONFIDENTIAL]**

[61] **[BEGIN HIGHLY CONFIDENTIAL]** [redacted] **[END HIGHLY CONFIDENTIAL]**

There is no economic basis for the reasons cited in the *FNPRM*'s for excluding cable best efforts BDS. The *FNPRM* states that best efforts services' lower prices and lower performance commitments necessarily place them in a different market. But those assertions ignore the real world fact (discussed above) that customers frequently do choose best efforts services over higher priced services with performance commitments. The reasoning in the *FNPRM* establishes that, at most, some customers are willing to pay more to get more while others prefer to pay less to get less, as is the case among products in almost every market.

2. Customer Classes.

The *FNPRM* asks whether a different CMT should apply for different "classes" of customer on the grounds that "if supply to a first customer group cannot be readily extended to a second, then supply to the first customer group may not place material competitive constraints on supply to the second."[62] We are not aware of any reliable evidence showing differences in the availability of competitive alternatives for any particular "class" of customers. It is our understanding that providers deploy facilities in a particular area, and then compete for *all* customers in that area, regardless of whether the customer is a retailer, mobile provider, or wholesaler, and regardless of the size of the customer. To the extent there are providers that specialize in certain types of BDS, they do not appear to be particularly significant.

Attempting to impose regulations based on customer class would likely also increase transaction costs, resulting in less investment and competition. For example, attempts to develop classes based on business size (*e.g.*, in terms of employees or some other measure) raise questions as to how to measure the size of the customer. Would it include all affiliates and subsidiaries? What is the correct measure of size when a parent company negotiates the

[62] *FNPRM* ¶ 199.

purchase of BDS for its affiliates and subsidiaries? In addition, the size of a BDS customer can increase or decrease, creating additional challenges to any size-based classification of customers.

As further evidence that the lines between any proposed customer classes would be unworkable, we note that many technology companies with only a small number of employees purchase highly sophisticated, high capacity, secure and reliable BDS. By contrast, many larger companies, measured in terms of employees, require lower bandwidth and less sophisticated suites of BDS.

Moreover, implementing a system that provides smaller customers with regulated access for services would also distort the marketplace by giving smaller BDS purchasers a regulatory advantage over their larger competitors.

The *FNPRM* also asks whether "multisite customers may fall into" a separate "class" for the purpose of BDS regulation.[63] As a threshold matter, we note that only a very small portion of BDS customers are multisite customers. According to the 2013 data, firms with fewer than 500 employees purchase BDS at only a single establishment,[64] and firms with fewer than 500 employees account for more than 99% of all firms and more than 84% of establishments with BDS service. This evidence indicates that most firms are single establishment customers.[65] In any case, it is our understanding that multisite BDS customers are typically quite large, and due to the large volumes they purchase, they are able to negotiate favorable prices and terms. Further, we understand that these sophisticated purchasers of BDS typically purchase services from a large variety of providers, based on which providers offer the best combination of price

[63] *Id.*

[64] *See id.* ¶ 73, Table 1.

[65] On average, there is one employee per establishment for firms having less than 20 employees. *Id.* ¶ 73, n. 185.

and quality in any given area. There is thus no market failure that needs to be addressed for these customers.

Finally, we note that if the Commission chooses to impose different regulations for different customer classes, we would expect such an approach to lead to *decreased or no regulation* for certain customer classes. For example, mobile backhaul purchasers, wholesale purchasers, and larger enterprises are among the largest and most sophisticated purchasers of BDS in the marketplace. We understand that these customers typically purchase services using RFPs, negotiate prices, use different providers in different locations to get the best prices and terms, and otherwise have substantial bargaining power. As a result, in areas deemed non-competitive by the competitive market test, these customers' classes will often have advantages that offset any need for regulation of BDS sales to these customers.

C. Number of Competitors.

Our CMT designates a census tract as competitive if there are two or more providers within 2,000 feet of the census tract, and our validation tests showed that virtually all ILEC buildings and bandwidth within the census tracts that pass this CMT are themselves within 2,000 feet of two or more providers.

The *FNPRM* asks whether two competitors are sufficient to ensure competitive results. As we have previously explained, in the marketplace for special access, two or more providers are sufficient to ensure competitive outcomes. The Commission itself has previously stated that the presence of two facilities-based providers is sufficient to ensure competition because "the presence of facilities-based competition with significant sunk investment makes exclusionary

pricing behavior costly and highly unlikely to succeed."[66] The D.C. Circuit agreed with this reasoning: "'the presence of facilities-based competition with significant sunk investment makes exclusionary pricing behavior costly and highly unlikely to succeed.'"[67] And, in merger proceedings, the Department of Justice has found that no divestitures are needed in buildings where, post merger, there would be one additional competitor [in addition to the ILEC] at or nearby the building, because the likelihood of anticompetitive harm was "unlikely."[68] We agree. As a matter of economics, price cap regulation is unnecessary and is, in fact, counterproductive in areas where rivals have deployed competing facilities-based networks. As a matter of economics, the *first* competitor would have the largest competitive impact, with additional competitors having only a diminishing incremental effect.

[66] Fifth Report and Order and Further Notice of Proposed Rulemaking, *Access Charge Reform; Price Cap Performance Review for Local Exchange Carriers*, 14 FCC Rcd. 14221, ¶ 80 (1999) ("*Pricing Flexibility Order*").

[67] *WorldCom, Inc. v. FCC*, 238 F.3d 449, 458-59 (D.C. Cir. 2001) (quoting *Pricing Flexibility Order* ¶ 80).

[68] Memorandum Opinion and Order, *AT&T Inc. and BellSouth Corp., Application for Transfer of Control*, 22 FCC Rcd. 5662, at ¶¶ 41-42 (2007) (emphasis added) (discussing the consent decrees). *See also* AT&T 3/21/16 *Ex Parte* 5.

Appendix A

I. METHODOLOGY FOR OUR COMPETITIVE MARKET TEST

Underlying the competitive market test ("CMT") is a simple method of identifying whether there is enough competition in a relatively static, easy to administer geography to justify no price cap regulations for business data services ("BDS"). For the purpose of this paper, we applied the CMT to census tracts. In order to identify whether a census tract is competitive, we relied on three sources of data: BDS facilities data from filer responses to Questions II.A.4 and II.B.3 and the related FCC-generated building resources, competitive fiber lines from filer responses to Question II.A.5 and the related FCC-generated fiber and fiber node distance to building resources, and DOCSIS 3.0 and fiber service reported to the National Broadband Map ("NBM") in December 2013. We processed these data at the parent company level and de-duplicated providers across data sources so that subsidiaries of the same company were treated as a single competitor regardless of technology.

Locations with BDS connections were reported in Tables II.A.4 and II.B.3. The FCC later processed these data to identify a building and census block for each location. The FCC's methodology for grouping locations into buildings and identifying the block of each building is described in the Wireline Competition Bureau Staff's memo, "FCC Special Access Data Collection Project: Additional Information on the Data and Information Hosted by NORC" released to researchers with access to the SADC Enclave. Locations for which the FCC could not identify a census block were excluded from the CMT. Additionally, locations reported in Table II.A.4 with a UNE or UCL supplier indicated and locations reported in Table II.B.3 where the total bandwidth sold equaled the total UNE bandwidth sold (where those values were non-zero) were excluded from the CMT. We refer to these data as BDS facilities data.

Next, we brought the FCC-generated fiber and fiber node distance to building resources—which calculated the distance that each building with a BDS connection was to every nearby providers' fiber line or node—to the parent company level, taking the minimum distance for each building and nearby fiber provider parent company by building. We limited these data to building-fiber provider combinations with a distance less than 2,000 feet. The resulting dataset was merged onto the BDS facilities data from Tables II.A.4 and II.B.3 by provider and building. Providers that did not offer a BDS connection at a building but have fiber or a node within 2,000 feet of a building were considered competitors within the census tract of that building.

It could be the case that a fiber line or node that is within 2,000 feet of a building is outside the boundaries of the census tract of the building. We considered the providers of such fiber lines or nodes competitive within the census tract of the building given their close proximity. The resulting dataset was then brought to the unique provider and census block level. We derived the census tract from the FCC-identified census block.

Lastly, we merged on information from the December 2013 NBM on DOCSIS 3.0 and Optical Carrier/Fiber to the End User at the block and provider level.[69] This was done after cleaning the NBM data to identify the parent company of various subsidiaries and to match the FCC Registration Number ("FRN") in the NBM to those used when providers reported to the SADC. If a cable operator served a census block within a census track using its HFC network, and that network was upgraded to DOCSIS 3.0 according to the NBM, then it was considered a competitor in that census tract. If a provider served a census block (in the census tract) with

[69] We deemed the use of the entirety of each DOCSIS network reported in the NBM as appropriate given the trend of cable companies towards enabling more and more of their headends for Metro Ethernet.

Optical Carrier/Fiber to the End User according to the NBM, *and* there were no fiber nor nodes nearby *any* building within that block according to Table II.A.5 and the related FCC distance data, then the provider was considered a competitor in that tract.

We believe that this treatment of fiber from the NBM can be considered conservative since a provider with fiber according to the NBM will not be deemed competitive if any other provider has nearby fiber according to Table II.A.5, even if it is a different provider. With the resulting data, we calculated the unique number of competitors in each census tract with either BDS service to a building in the tract, fiber within 2,000 feet of a building in the census tract, or HFC running DOCSIS 3.0 in one of the census blocks in the tract. If no fiber was found within 2,000 feet of a building in the census tract, we counted providers having fiber in a census block as a competitor .

II. METHODOLOGY FOR VALIDATION OF OUR COMPETITIVE MARKET TEST

The simple methodology behind the CMT potentially allows for idiosyncrasies within a census tract to misrepresent the extent of competition. For example, consider a large tract with a suburban office park in one corner at which three providers compete, as well as a large urban business district in the opposite corner where only a single provider offers service. Under the CMT, this tract would be deemed competitive; yet, only a small fraction of demand might be truly subject to competition. Therefore, in order to validate the reliability of the CMT, we calculated the share of ILEC-served buildings with two or more providers either having a connection in the building or having a fiber or fiber node within 2,000 feet of the building, for each building located in every census tract that passed our proposed CMT.[70] If a provider of

[70] We considered locations reported in Table II.A.4 with connections from ILEC affiliates as ILEC locations when they fell within the parent ILEC's serving territory.

DOCSIS 3.0 or Optical Carrier/Fiber to the End User operated in the census block of an ILEC-served building, they were considered relevant competition to that building. Buildings that meet these criteria, that is, have two or more providers at or nearby considering BDS facilities, fiber networks within 2,000 feet, and NBM DOCSIS or fiber in the building's census block, are hereinafter referred to as *competitive buildings*. Again, if any provider's fiber or node was nearby a building according to Table II.A.5 and the related FCC resources, providers with fiber in the block reported in the NBM were not counted as competitive.

We also calculate the share of ILEC bandwidth and connections in *competitive buildings*. Specifically, if an ILEC location ID reported in Table II.A.4 or Table II.B.3 was within a census tract that passed the CMT, then it was counted in the denominator for connections and its total bandwidth was counted in the denominator for bandwidth. If the ILEC location ID was within a census tract that passed the CMT and within a *competitive building*, then it was counted in the numerator for connections and its total bandwidth was counted in the numerator for bandwidth. Note, the FCC masked bandwidth figures over one Gbps in the data; for the purpose of this analysis, we treated these records as having 1,001 Mbps of bandwidth.

Additionally, we considered the share of establishments as reported by Dun & Bradstreet in census blocks that contain at least one *competitive building*. If a census tract passes the CMT, all establishments associated with blocks that have special access service by an ILEC within the tract are factored into the denominator. Only establishments in blocks with at least one *competitive building* within a census tract passing the CMT are counted in the numerator.