# Analysis of the Revised Regressions Disclosed By FCC Staff on August 22, 2016

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## Fourth White Paper

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## I. PURPOSE AND SUMMARY.

In this paper we analyze the regressions that the Federal Communications Commission ("Commission") Staff placed in the record on August 22, 2016 and has used to draw inferences about whether ILECs exercise market power over DS1 and DS3 services.[1] With one exception, discussed below, these regressions are the same as those previously submitted by the Commission on June 28, 2016,[2] which in turn were based on the regressions presented in Professor Rysman's May 2, 2016 paper.[3] Consequently, these new regressions embody the same core shortcomings as the prior regressions. These flaws include: (i) a severe causation/correlation problem referred to by economists as "endogeneity;" (ii) incomplete and incorrect data on pricing and the number of competitors; and (iii) mismatches in the pricing and competitor data. And the effect of these flaws is clear from the results of both the prior and the new regressions, which are internally inconsistent and, in many cases, contrary to basic economic principles. Moreover, as we have shown, even if these flaws are ignored, and the results are taken at face value, they fail to produce any consistent pattern from which an economist could reliably conclude that ILECs exercise market power. All of these findings are

[1] *See* Federal Communications Commission Staff, Update on the Use of Cluster-Robust Standard Errors in Business Data Services Regressions (Aug. 22, 2016) ("FCC 8/22 Memo"), *available at* http://transition.fcc.gov/Daily_Releases/Daily_Business/2016/db0822/DOC-340891A1.pdf.

[2] Wireline Competition Bureau, Peer Review of *Empirics of Business Data Services* White Paper by Dr. Marc Rysman (April 2016); *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 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 (June 28, 2016) ("FCC 6/28 Memo"), *available at* http://transition.fcc.gov/Daily_Releases/Daily_Business/2016/db0708/DOC-340040A8.pdf.

[3] Marc Rysman, Empirics of Business Data Services: White Paper at 218-19 (Apr. 2016) ("Rysman White Paper"), attached as Appendix B to the 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 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*").

comprehensively documented in our prior papers,[4] as well as in the peer reviews of the regressions and in the submissions of other economists participating in this proceeding.

The Commission Staff's August 22, 2016 regressions simply implement a small update to these prior flawed regressions: They utilize a more appropriate method of calculating the statistical significance of the estimated coefficients. Aside from this single change, these new regressions contain the same flaws as do the prior regressions, and thus they are still unable to produce results upon which one could base a valid inference of market power. In fact, as we explain further below, if one were to ignore their shortcomings and take the regression results at face value, the revised regressions provide even less evidence of ILECs' exercising market power for DS3 and DS1 services because the correction to the method for estimating statistical significance makes many of the previously significant regression results statistically insignificant.

[4] Mark Israel, Daniel Rubinfeld & 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 (Jan. 27, 2016) ("IRW First White Paper"); Declaration of Mark Israel, Daniel Rubinfeld & Glenn Woroch (Feb. 19, 2016) ("IRW Decl."), attached as Attachment A to the 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 (Feb. 19, 2016) ("AT&T 2/19 Reply Comments"); Supplemental Declaration of Mark Israel, Daniel Rubinfeld & Glenn Woroch (Mar. 23, 2016) ("IRW First Supp. Decl."), attached to Letter from Christopher T. Shenk (AT&T) & Russell Hanser (CenturyLink) to Marlene H. Dortch (FCC), *Special Access Rates for Price Cap Local Exchange Carrier Rates for Interstate Special Access Service; 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 (Mar. 24, 2016); Second Supplemental Declaration of Mark Israel, Daniel Rubinfeld & Glenn Woroch (Apr. 20, 2016) ("IRW Second Supp. Decl."), attached to Letter from Christopher T. Shenk (AT&T) 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 Service*, WC Docket No. 05-25, RM-10593 (Apr. 20, 2016); Mark Israel, Daniel Rubinfeld & Glenn Woroch, Analysis of the Regressions and Other Data Relied Upon in the Business Data Services FNPRM and a Proposed Competitive Market Test: Second White Paper, *Business Data Services in an Internet Protocol Environment; 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 (June 28, 2016) ("IRW Second White Paper"); Mark Israel, Daniel Rubinfeld & Glenn Woroch, Analysis of the Regressions and Other Data Relied Upon in the Business Data Services FNPRM and a Proposed Competitive Market Test: Third White Paper, *Business Data Services in an Internet Protocol Environment; 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 (June 28, 2016) ("IRW Third White Paper").

For these reasons, these new regressions confirm our prior conclusions – consistent with those of the peer reviews and other economic testimony in this proceeding – that the Staff's regression analysis (i) is based on data that are not sufficient to establish a causal relationship between number of competitors and BDS prices, (ii) reflects a number of methodological errors, and thus (iii) cannot be relied upon to conclude that ILECs exercise market power for DS1 or DS3 services.

The new regressions also highlight an important inconsistency in the regulatory proposals advocated in this proceeding. One of the features of the new regressions is that they separately test for the exercise of ILEC market power in price cap (no relief), Phase I, and Phase II areas. Hence, if taken at face value, these regressions would allow one to test proposals that the Commission should implement a dramatic one-time reduction to price cap levels for DS1 and DS3 services, and implement further reductions through an increased prospective X-factor.

The test is simple: If the regressions fail to provide evidence that ILECs exercise market power in Phase I areas – where ILECs are subject to price caps – those results indicate that the existing price caps are already set at or below competitive levels and are thus constraining the ILECs from exercising market power. In fact, the regressions fail to provide any valid evidence that ILECs exercise market power in Phase I areas. Thus, if the Commission credits the regressions as effectively assessing the presence or absence of ILEC market power, then, to be consistent, it should conclude that there is no basis for either a one-time reset or prospective decreases to the existing DS1 and DS3 price caps in Phase I areas.

## II. THE REVISED REGRESSIONS DO NOT ESTABLISH THAT ILECS EXERCISE MARKET POWER.

The purpose of the Commission Staff's most recent regressions, as with the prior regressions submitted by Professor Rysman and by Commission Staff, is to assess whether

ILECs exercise market power for DS1 or DS3 services using data in the 2013 Special Access Data Collection ("SADC").[5] The theory behind the use of the regressions for such an assessment is that if ILEC prices are lower in areas with more competitors, then ILECs must possess market power in areas that lack competition. The regressions, therefore, look for a statistically significant inverse relationship between ILEC prices and measures of competitive activity. These measures of competitive activity include, for example, whether a competitor has deployed fiber in the same census block, a connection to a building in the same census block, or a connection to the same building as the ILEC.

The new Commission Staff regressions are identical to the prior regressions it submitted on June 28, 2016 (which, in turn, are expanded versions of the regressions presented in Professor Rysman's May 2, 2016 Paper), except that they implement a more appropriate method for calculating the standard errors and thus determining the statistical significance of the estimated coefficients. *Accordingly, these new regressions contain the same intractable flaws previously identified by the peer reviews of those prior regressions, as well as by us and other economists participating in this proceeding*. These flaws have been comprehensively documented, and we do not repeat them here. Because the new regressions continue to reflect the same flaws as the prior regressions, they also continue to produce results from which no reliable economic conclusions about ILEC market power can be drawn.

To be specific about the correction that was implemented in the new regressions, we begin by noting that Professor Rysman's original regressions relied on robust (but not "clustered") standard errors, which are used to determine the statistical significance of the

[5] We noted that similar regressions conducted by Professor Rysman, Commission Staff, and by us, found no evidence of market power for any services above 50 Mbps, or for any Ethernet services (above or below 50 Mbps).

regression results.[6] But, as the peer reviews and other economic testimony confirmed, robust standard errors overstate statistical significance because they fail to account for the fact that prices and competitive conditions in nearby buildings tend to be highly correlated. Instead, clustered standard errors should be used, and the question then becomes at what level of geographic granularity should observations be clustered.

The June 28, 2016 regressions attempted to address the need for clustered standard errors by computing standard errors that are clustered at the census block level. But as we showed – consistent with the peer reviews – this level of geographic granularity is too small. As Commission Staff acknowledges, as many as 60% of the census blocks that are used to estimated Professor Rysman's regressions have only one LEC circuit, so there was no clustering done in those cases.[7] Moreover, the economic testimony identified significant correlation among observations across census blocks within census tracts, indicating that clustering should done at least at the census tract level.[8]

The Commission Staff's August 22, 2016 regressions improve the estimate of the standard errors used to estimate the statistical significance of the regression results by computing the standard errors using clustering at the census tract level, rather than at the census block level. As a result of this change, many of the results from the prior regressions that purported to show statistically significant evidence of market power are now statistically insignificant. As explained by the Commission Staff: "focusing on D1s and DS3s, with the tract level cluster-robust standard errors, again a number of our competition variables lose statistical significance."[9]

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[6] Robust estimation methods vary from program to program, but typically account for problems relating to heteroscedasticity and non-normal errors.

[7] FCC 6/28 Memo, Attachment 1, at 2.

[8] IRW Third White Paper at 25 n.67.

[9] FCC 8/22 Memo at 3.

Nonetheless, the Commission Staff states that "it remains the case that overall the regressions show that competition lowers ILEC prices by an amount that is statistically distinguishable from no effect."[10] We disagree. To reach such a conclusion, it would be necessary, as a threshold matter, to ignore the substantial limitations in the data that substantially bias the regression results, as has been documented by the peer reviewers, and multiple economic experts in this proceeding.[11] Even if these serious problems could legitimately be ignored, as we discuss below, there is still no valid economic basis for concluding that the regressions "overall" establish that ILECs have market power. To the contrary, the regression results produce a stronger case for the opposite conclusion.

*The DS3 Regressions.* The Commission Staff's August 22, 2016 submissions contain six main sets of DS3 regressions, which are reported in Tables 14.b-19.b.[12] These new regressions correspond to the same regression models originally estimated by Professor Rysman, and reported in Tables 14-16 of his original paper, except that they also separately examine price cap, Phase I, and Phase II areas.

Even setting aside the serious limitations in the data used for these regressions, they do not support the Commission Staff's assertion that "overall" the regressions show that

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[10] *Id.*

[11] *See, e.g.*, IRW Second White Paper at 4-27; IRW Third White Paper at 11-26; 30-32; Declaration of John W. Mayo at 17-34 ("Mayo Decl."), attached as Exhibit B to the Comments of Comcast Corp., *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 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 (June 28, 2016); Reply Declaration of Michael L. Katz And Bryan G.M. Keating (On behalf of NCTA) ("Katz/Keating Decl."), at 21-43, attached as Exhibit A to Reply Comments of The National Cable & Telecommunications Association, *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 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 (Aug. 9, 2016).

[12] There is another regression reported in "Table 20" but it is largely duplicative of regressions in Table 14.a-b, as discussed below, and thus adds very little, if anything to the analysis.

"competition lowers ILEC prices by an amount that is statistically distinguishable from no effect."[13] For DS3s none of the regression results for "all areas", "price cap areas" or "Phase I areas" are statistically significant, so none of those regressions could support a finding that competition lowers ILEC prices. And for Phase II areas, only two of the six regressions (those reported in Tables 14.b and 15.b) show a significant effect of competition on ILEC prices. The remaining four regressions (those reported in Tables 16.b, 17.b, 18.b, and 19.b) show no such significant relationship between competition and ILECs' prices and thus cannot support an inference of market power. Thus, contrary to the Commission Staff assertion, the regressions show no robust pattern of effects from competition and thus, as a whole, do not support an inference of market power.

Reliance on the two regressions for Phase II areas that produce statistically significant results, while ignoring the other regressions, is especially inappropriate here because, as explained below, the regressions that show no evidence of competition affecting ILEC prices contain more complete specifications of competitive effects than the two that do find such effects.

The two regressions on which the Commission Staff focus are reported in Tables 14.b and 15.b. The regression reported in Table 14.b is particularly simplistic: It examines only the relationship between ILEC prices and whether a CLEC has a connection in the same census block. The regression in Table 15.b is also simplistic; it just adds a variable for whether a competitor has deployed fiber in the census block with no additional measures of competition and no interaction between those that are included.

[13] FCC 8/22 Memo at 3.

The regressions reported in Tables 16.b-19.b – which do not support a finding that ILEC prices respond to competition – are more comprehensive than those reported in Tables 14.b and 15.b, because they account for other important factors and interactions that are ignored in Tables 14.b and 15.b. Table 16.a also accounts for the fact that the existence of a competitor's fiber in a census block will be correlated with whether the competitor has a connection in the census block. Tables 17.b and 18.b also account for whether a competitor has a connection to the same building as the ILEC. And Table 19 separately examines the impact of different numbers of competitors (one, two, three, or four or more) with connections to a building in the same census block. None of these regression models finds any significant effects of competition.

Hence, the more fully specified models do not support the Staff's inference of market power in Phase II areas. And as a whole, the regressions simply do not find the type of consistent, robust pattern that one should expect before relying on regression as affirmative evidence for any economic conclusion.

The Commission Staff also points to another regression, reported in Table 20, which does not actually add anything new to the results described above. The only difference between Tables 14 and 20 is that, rather than estimating the model for distinct regulatory regions, Table 20 uses an "interaction variable" to allow for different competitive effects in Phase I and Phase II areas. As such, Table 20 is simply a more restrictive version of Table 14: Table 20 assumes that only the competition indicators have different effects by regulatory region, while assuming that the various control variables affect ILEC prices in the same way regardless of regulatory region. We tested the assumption that the control variables had the same effects on ILECs' prices across all regulatory areas and easily rejected that they were the same for either Phase I or Phase II

regions. In our view, because they simply impose additional restrictions on the data that are not warranted statistically, the results in Table 20 add no value to the analysis.

*The DS1 Regressions.* Even ignoring the substantial limitations in the underlying data used for the regressions, the regressions fail to support a conclusion that ILEC prices are higher in areas with less competition because they produce only a patchwork of anomalous and insignificant results.

As with DS3 services, the Commission Staff has produced six new DS1 regressions for price cap, Phase I, and Phase II areas, reported in Tables 14.a-19.a. One of the most striking aspects of these regressions is that they produce results that are facially invalid, which further indicates that the shortcomings in these data and regressions, which means that they cannot be relied upon. For example, a portion of the results for Tables 14.a, 15.a, 17.a, 18.a, and 19.a indicate that ILECs reduce prices in response to competition in price cap areas where they have no pricing flexibility. These results are clearly not capturing any actual ILEC response to competition (or lack of competition), because, as has been previously documented, ILECs lack the ability to respond selectively to competition with higher or lower prices in these areas.

As we have previously discussed, the Commission Staff has attempted to dismiss these anomalous results by stating that the effects are so small that they can be ignored (they range from about 1.4% to about 2.9%). But these effects are very close in size to the DS1 regression results for Phase II areas (about 3.2%) on which Commission Staff relies to conclude that ILECs are exercising market power. Given such a small difference, it must be that either both are too small to matter or both are correct and the regressions are flawed – either way the regressions cannot legitimately be relied upon as a basis for finding that ILECs exercise market power.

Focusing on the regressions for Phase II areas (as Commission Staff does), the results show no consistent pattern from which one could legitimately conclude ILEC prices are lower in areas with competition. Again, the Commission Staff appears to focus its attention on Tables 14.a and 15.a, both of which purport to show that ILEC prices are slightly lower in areas where at least one competitor has deployed facilities to a building in a the same census block. But the more complete specification, shown in Table 16.a – which accounts for whether there is also fiber connected to a building and the fact that such fiber may increase the likelihood of a building connection – shows no statistically significant relationship between ILEC prices and the there being a competitor connected to a building in the same census block.

Likewise, in contrast to Tables 14-15, the regression in Table 19.a for DS1 circuits in Phase II areas finds *no* statistically significant ILEC response to one competitor connected to a building in the same census block or four or more competitors connected to a building in the same census block. Moreover, that same regression in Table 19.a produces a highly anomalous result: Although it shows no statistically significant ILEC responses to one or four or more competitors, it shows a statistically significant ILEC response to just two or three competitors with connections in the same block. There is no legitimate economic theory that would explain why ILECs would ignore one competitor and four or more competitors, but respond with price cuts when faced with two or three competitors. Hence, the more reasonable conclusion is that the flaws in the underlying data and methods lead to unreliable results.

As noted above, the Commission Staff's August 22, 2016 memorandum also relies upon another set of regressions, reported in Table 20, which uses "interaction" variables to examine separately Phase I and Phase II areas, rather than running the regressions separately for Phase I and Phase II areas (as is done in Tables 14.a-19.c.). As also noted, such an approach adds little

to the record. In addition, there are actually two versions of this table that produce inexplicably divergent results for DS1 services. One version examines results only for areas within MSAs that have BDS demand, and the other version examines all areas with BDS demand. The regression that is limited to MSAs produces relatively small but statistically significant results for DS1 services in Phase II areas, but the regression that covers all areas (not just MSAs) produces no statistically significant results for DS1 services in Phase II areas. These differences provide further evidence that the results generated from the regression analysis are not sufficiently robust to support an inference of market power.

Finally, as we have previously demonstrated, even if there were a legitimate basis for relying on the subset of DS1 regression results that produce statistically significant results for Phase II areas those results, as with Professor Rysman's original regressions, show that ILEC prices are at most 3-4% lower in the face of competition. Professor Rysman himself has acknowledged that such effects are "not especially large by the standards of competition analysis."[14] And as we have and others have explained, the risks of regulating DS1 services – including decreased investment, innovation, and competition – likely far outweigh any potential benefits of reducing ILEC prices by 3-4 percent.[15]

## III. IF THE COMMISSION RELIES ON THE REGRESSIONS, IT MUST REJECT PROPOSALS TO REDUCE PRICE CAPS.

The regression results for Phase I areas highlight an important inconsistency in the regulatory proposals advocated in this proceeding. When examining the regression results for

[14] Rysman White Paper at 228-29.

[15] *See, e.g.*, IRW Second White Paper at 20-21; IRW Third White Paper at 25; Katz Decl. at 9-72; Declaration of Joseph Farrell, DPHIL at 2-30 ("Farrell Decl."), attached as Exhibit A to the Comments of Comcast Corp., *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 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 (June 28, 2016).

Phase I areas in Tables 14.a-19.b, none produce statistically significant evidence of ILEC market power for DS3 services, and most produce no evidence of ILEC market power for DS1 services. These results have direct implications on proposals to adopt new rules that would impose a one-time reduction to price cap levels for DS1 and DS3 services, and further reductions to those price caps through increased prospective X-factors. In particular, if the Commission were to conclude that regressions can be used to assess market power, the fact that no such market power is detected in Phase I areas means the Commission must reject proposals to reduce price caps. The reason is simple. If the regressions accurately detect market power, the fact that they do not detect market power in Phase I areas, where ILECs are precluded from raising prices above price cap levels, means that existing price caps are already set at or below competitive levels and are thus already constraining the exercise of ILEC market power.

Moreover, even if the Commission were to focus on the few instances where the regressions produce statistically significant results, those results relate to DS1 services, and are very small (in the 1-3 percent range), and thus could justify, at most, a very small decrease to price caps and only for DS1 services.