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October 20, 2016

Via ECFS

Ms. Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

Re: Response To Sprint Price Cap/X-Factor Analysis, WC Docket Nos. 16-143, 05-25, RM-10593

Dear Ms. Dortch:

AT&T Services, Inc. files the Second Supplemental Declaration of Mark E. Meitzen, Ph.D. and Philip E. Schoech, Ph.D. ("Second Supp. Declar."). Drs. Meitzen and Schoech respond to an October 5, 2016 letter submitted by Chris Frentrup on behalf of Sprint Corporation[1] wherein he attempts to rehabilitate the deficiencies noted by AT&T[2] and CenturyLink[3] of Sprint's *revised* Price Cap/X-Factor analysis.[4]

As Drs. Meitzen and Schoech explain in this Declaration:

- Sprint's new proposal is mathematically impermissible in that Sprint proposes to use the BLS KLEMS data for total factor productivity (TFP) (one of the X-factor inputs), but to use Connect America Cost Model (CACM)-related data for the input price growth component of the X-factor equation. This data mismatch violates the economic principle of duality. To correctly calculate the X-factor (and, thus, the backward-looking price cap reset), the TFP component of the X-factor must be developed using the *same* measure for input price growth as is used in the overall X-factor equation.[5]

1 Letter from Chris Frentrup to Marlene H. Dortch (filed Oct. 5, 2016) ("Frentrup Letter").
[2] *See* Supplemental Declaration of Mark E. Meitzen and Phillip E. Shoech, Christensen Associates (filed Sept. 2, 2016) ("Christensen Supp. Declar."); Ex Parte Letter from Keith M. Krom, AT&T, to Marlene H. Dortch, Secretary, FCC, (filed Oct. 7, 2016) ("AT&T 10/07/16 Ex Parte").
[3] *See* Mark Schankerman and Pierre Régibeau, Response to the FCC Further Notice: Regulation of DS1 and DS3 Services (filed Aug. 9, 2016).
[4] *See* Declaration of Chris Frentrup and David E.M. Sappington, contained in *Ex Parte* submittal from Jennifer Bagg, Counsel to Sprint Corporation (filed Aug. 31, 2016) ("F&S Declaration"). The F&S Declaration appears to repudiate Sprint's earlier proposal of using EU-KLEMS data for calculating the X-Factor, rather than BLS KLEMS data. *See* Declaration of David E. M. Sappington and William P. Zarakas (June 28, 2016).
[5] Drs. Meitzen and Schoech previously explained that if Sprint consistently applied its CACM-based input price growth estimate to developing TFP as it proposes to use in the X-factor equation, the effects of its input price growth

- When the logical implications of Sprint's severe assumptions and mismatched data are compared against actual empirical measures of the U.S. telecommunications industry published by the Bureau of Labor Statistics, Sprint's proposed productivity calculations are shown to produce results that are completely counter to these BLS empirical measurements.
- Even if Sprint's proposed violation of fundamental economic consistency principles could be ignored, the overall input price growth estimates developed by Sprint rely on input proportions and price growth data associated with CACM which are wholly inappropriate because they are highly inaccurate and were purposefully developed to understate actual input price growth, which when used only in the X-factor formula (and not also in the TFP formula) would overstate the X-factor.
- In any event, all the Frentrup letter really attempts to do is to "fine tune" a portion of the input price growth data proposed by Sprint to address deficiencies pointed out in Drs. Meitzen and Schoech's previous declarations. The Frentrup Letter's adjustments are of little import because they either remain incorrect, are inadequate, or continue to imply highly implausible results. Further, there is no amount of tinkering of input price growth rates that can correct for the fundamental economic flaws of Sprint's proposal to use mismatched data sets, especially where one of the data sets is known to be biased downward and inaccurate.

In sum, as the attached Second Supp. Declar. makes clear, there is no basis to attach any credence to the figures developed by Sprint's calculations. The only valid measurements of a BDS X-Factor is the one developed by BLS KLEMS data, and these data show the X-factor to be 1.99 percent over the 2005-2014 period - which suggests that there is no empirical basis for any one time reduction (or increase) to current price cap levels.

If you have any questions or need additional information, please do not hesitate to contact me.

Sincerely,
/s/ Keith M. Krom

substitution would cancel out and produce the same X-factor result as Drs. Meitzen and Schoech found when they did the calculation using the correct measure of input price growth (BLS KLEMS data) – *i.e.*, there would be no basis for resetting price caps, and the annual X-factor should be no higher than 1.99 percent. *See* AT&T 10/07/16 Ex Parte.

CHRISTENSEN ASSOCIATES

Second Supplemental Declaration of

Mark E. Meitzen, Ph.D. and Philip E. Schoech, Ph.D.

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October 18, 2016

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INTRODUCTION

We are Dr. Mark E. Meitzen and Dr. Philip E. Schoech of Christensen Associates. On June 28, 2016, we submitted an assessment of the FCC's proposed options for the special access price cap X factor in which we concluded that the BLS KLEMS method is the best approach for establishing the X factor. We also concluded that among the different time periods under consideration for calibrating the X factor, the 2005-2013 period was the most appropriate and over that period the BLS KLEMS method produced an X factor of 1.95%.[1]

On August 9, 2016, we submitted reply comments that incorporated BLS updates to its KLEMS database, most particularly to add data for 2014.[2] Based on these updated data we calculated a revised X factor of 1.99% for 2005-2014. In our reply we also critiqued the Declaration of David E.M. Sappington and William P. Zarakas submitted on behalf of Sprint Corporation.[3] We concluded that their proposal, based on EU-KLEMS data, was misinformed and generally an ill-considered alternative to BLS KLEMS for calculating the X factor demanded by the FNPRM. Apparently, Sprint agreed with these criticisms because on August 31, 2016, it filed a Declaration by Chris Frentrup and David E.M. Sappington ("F&S") that appears to repudiate Sprint's prior proposal to use a value-added measure of total factor productivity ("TFP") based on EU-KLEMS data and a peculiar input price index that did not include all inputs used to produce the industry's output.[4] Instead, F&S advocated use of BLS KLEMS measurement of gross-ouput TFP, but not use of the integral input price index developed by BLS productivity experts. In place of this BLS price index, F&S proposed to use a small collection of highly aggregated speculative input price growth estimates that had some connection to a peer review response developed in 2013 by the Commission staff concerning its Connect America Cost Model ("CACM") for universal mass-market broadband service with a VoIP add-on.

On September 22, we submitted a Supplemental Declaration responding to F&S.[5] We stood by our initial assessment that BLS KLEMS measurements of TFP and input prices represented the best methodology and employed the best data for establishing the X factor. We also documented a number of fatal economic and mathematical deficiencies in F&S' proposal to use a highly peculiar and inconsistent set of CACM-related input price growth estimates in preference to the BLS' integrated calculations for these figures to establish the special access X factor.

In this Second Supplemental Declaration, we respond to the October 5, 2016 filing by one of F&S' authors, Chris Frentrup, on behalf of Sprint Corporation.[6] The Frentrup Declaration attempts to rehabilitate a few of the deficiencies that we noted in the original F&S proposal, but ignores the most significant ones. In particular, Frentrup attempts to pivot the position taken by F&S (that BLS KLEMS' measurement of input price growth should be used to calculate TFP, but not used in the Commission's equation to calculate the X factor) to one that disavows the BLS' development of input costs in addition

[1] Mark E. Meitzen and Philip E. Schoech, "Assessment of the FCC's Proposed Options for the Special Access Price Cap Factor," June 28, 2016.
[2] Reply Comments of Mark E. Meitzen and Philip E. Schoech, August 9, 2016.
[3] Declaration of David E.M. Sappington and William P. Zarakas, June 28, 2016.
[4] Declaration of Chris Frentrup and David E.M. Sappington, submitted via an ex parte letter from Jennifer Bagg, Sprint Corporation to Marlene H. Dortch, June 28, 2016.
[5] Supplemental Declaration of Mark E. Meitzen and Philip E. Schoech, September 2, 2016 ("Supplemental Declaration").
[6] Letter from Chris Frentrup to Marlene H. Dortch, October 5, 2016 ("Frentrup Declaration").

to input prices. This willingness to jettison increasing portions of BLS KLEMS productivity analysis and to disregard the basic rules of economic and mathematical consistency reduces Sprint's series of Declarations to makeweight rationalizations in favor of a particular X factor value rather than the development of an economically-defensible productivity basis for special access regulation.

The current filing by Frentrup does nothing to resolve the fundamental flaws in F&S' mismatched proposal as it fails to refute, and often fails even to address our criticisms of the F&S analysis. Its most egregious deficiencies are:

- failure to refute our criticism of F&S' violation of fundamental economic duality;
- unwillingness to confront the implications of our empirical sanity checks on the F&S proposal;
- failing to account for the fact that the CACM-related input prices F&S employs are both unreliable and purposefully understated.

It is important to recognize that the errors we noted in the F&S proposal that are most fatal are those that are given either cursory attention or completely ignored in Frentrup's response. Rather, the bulk of the Frentrup Declaration deals with fine-tuning input price estimates that are already methodologically impermissible or impossibly inaccurate for the purpose of determining the X factor. In sum, the Frentrup Declaration provides no compelling rehabilitation of the F&S proposal and provides no guide to a valid productivity-based development of the X factor – on either a conceptual or an empirical basis.

FRENTRUP'S REJOINDER TO OUR ECONOMIC CRITICISMS OF THE F&S ANALYSIS IS UNPERSUASIVE AND MISGUIDED

Frentrup's Declaration disputes our criticism of the F&S proposal that it violates the fundamental economics of productivity analysis -- claiming that we have drawn incorrect inferences from the principle of duality. Frentrup argues that despite F&S' claim that the BLS' fails to accurately identify the input prices paid for BDS production factors, the BLS' does accurately develop the input quantities used to produce BDS. Therefore, according to Frentrup, CACM-related input prices multiplied by BLS-developed input quantities result in BDS costs that vary in exact lockstep to F&S' postulated CACM-related input prices. As we show below, this opportune relationship is highly implausible. Its implausibility is confirmed by the empirical sanity checks we performed in our Supplemental Declaration. Further, these sanity checks also refute Frentrup's efforts to bolster use of CACM-related input prices by asserting that their hypothetical nature implies that they are forward-looking.[7]

Frentrup Fails to Justify F&S' Choice to Ignore the Economic Principle of Duality

As we and Professor Mark Schankerman and Dr. Pierre Régibeau demonstrated in our respective Supplemental Declarations, F&S' choice to combine speculated CACM-related input price growth figures with the BLS KLEMS measurement of TFP violates the economic principle of duality.[8] While the Frentrup Declaration attempts to manufacture an after-the-fact justification for this failure to respect this basic economic link between input prices, input quantities and TFP, this attempt fails on theoretical and empirical grounds.

[7] Frentrup Declaration, pp. 2-3.

[8] See, Mark Schankerman and Pierre Régibeau, "Supplemental Declaration: Comments on the Frentrup-Sappington Report," October 6, 2016, pp. 3-6; and our Supplemental Declaration, pp. 3-5.

Frentrup's first defense for why the F&S analysis chose to ignore economic duality was that while our duality argument could "conceivably be correct," it was also possible that the industry might have consumed input quantities exactly equal to those measured by the BLS – even if the industry had faced input prices exactly as speculated by F&S.[9] The confluence of circumstances required to produce this hypothesized alignment is extremely improbable and economically illogical.

F&S' proffered CACM-related input price series suggests substantially lower rates of input price growth than those measured by BLS experts from their comprehensive year-by-year industry data. But just as fundamental to economics as duality, is the principle that consumers and firms are optimizing entities that respond to price changes. This means that firms choose input proportions that minimize the cost of producing a given level of output at the input prices they are required to pay. If, as F&S claim, the input prices that actually faced BDS producers were substantially different from the input prices that the BLS' calculated, these optimizing firms would have chosen to purchase a different, more economical, input set than what the BLS computed. Thus, Frentrup's claim that this purchased input set would have been unchanged in the face of F&S' widely different input price series is nothing short of a rejection that BDS producers are economic actors.[10]

In addition to ignoring basic economic principles of optimizing behavior and price elasticity, the pairing of the CACM-related low-growth input price series with unchanged BLS input quantities raises other economic inconsistencies in the F&S approach. For example, if the BLS KLEMS input quantities are correct, then Frentrup's use of CACM-based cost weights for his input price index is incorrect. The correct weights would reflect the BLS input quantities and costs. In addition, notwithstanding F&S' violation of basic economic principles, if F&S had developed a more "BDS-specific" input price series, it would be equally appropriate (and, indeed, required) to adjust BLS KLEMS TFP (as suggested by Schankerman and Régibeau) to make it more BDS-specific. This would imply significant downward adjustments to BLS KLEMS TFP that would reduce the implied BDS X factor.[11]

Frentrup Does Not Explain Why the F&S Proposal Fails All Empirical Sanity Checks

Frentrup's Declaration does not even mention, let alone rebut, the empirical sanity checks we performed that demonstrate red flags to the F&S proposal. As we noted in our Supplemental Declaration, even if one assumes that it is appropriate to jettison economic duality by mismatching BLS KLEMS TFP data with CACM-related input price data (and it absolutely is not), there are empirical sanity checks that can demonstrate whether the F&S proposed input price index is consistent with BLS measures for TFP and output price growth. Our analysis found that "rather than demonstrating that the F&S input price index is consistent with other KLEMS data and comport with empirical observation,

[9] Frentrup Declaration, p. 2, fn. 7.

[10] The only scenario under which Frentrup's "input set unchanged" speculation has any consistency with economics is if the production function for BDS allows for no substitutability of different input factors (e.g., more labor replacing some capital) and BDS customers have perfectly inelastic demand for special access (i.e., will buy the same amount no matter what the price) so that BDS producers' demands for inputs are perfectly price inelastic. The empirically illogical implications of this scenario are too large to even begin mentioning – and Frentrup makes no effort to suggest its plausibility.

[11] Supplemental Declaration, p. 7; Mark Schankerman and Pierre Régibeau, Response to the FCC Further Notice: Regulation of DS1 and DS3 Services, August 9, 2016; and Ex Parte presentation to the Commission on "Price Cap Design for Business Data Services" dated August 15 & 16, 2016.

these checks indicate F&S' index to be at odds with reality."[12] Most telling is the implication of F&S' data mix for output price growth in wired telecommunications relative to the rest of the Broadcasting and Telecommunications industry. If F&S' combination of its alternative input price index with BLS TFP is to be plausible, wired telecommunications should show a lower rate of output price growth than the rest of the larger industry. But the BLS' Producer Price Indexes for the individual sectors shows just the opposite.

A further sanity check is provided by Schankerman and Régibeau who examine BLS' published measures for labor productivity that are disaggregated between wired telecommunications, wireless telecommunications and broadcasting.[13] They demonstrate that the growth in labor productivity in wireless telecommunications and broadcasting sectors so exceeds labor productivity's growth in wired telecommunications that it is practically impossible for TFP growth in wireless telecommunications and broadcasting to have been lower than in wired telecommunications as speculated by F&S.

These sanity checks confirm that the deficiencies we identified in F&S and in Frentrup's attempted rehabilitation are fatal. If Sprint's convoluted construction of an X factor is to have any validity, it must have some buttressing either from economic logic or empirical data. But this construction contradicts economic logic, and the empirical data reject it.

Frentrup Incorrectly Equates Hypothetical with Forward-Looking

Perhaps to deflect attention from F&S' failure to respect economic duality and its inconsistency with empirical evidence, Frentrup claims our critique of F&S is a misguided attack on forward-looking costs:

> M&S … object to using the Connect America Cost Model ("CACM") to derive estimates of input price growth rates on the grounds that the CACM uses forward-looking costs rather than the costs the price cap LECs actually incur.[14]

This is specious. While we agree that the X factor should be forward-looking, we believe that it must also reflect the level of productivity growth that firms actually providing BDS may be expected to achieve. This is best determined by looking to the recent history of what productivity levels BDS producers have actually been able to achieve. While a forward-looking model of what actual BDS producers might achieve in the future could possibly be superior to use of historic data, Sprint's proposal to use CACM-related values to adduce such productivity levels does not achieve this. First, the CACM is a static model. Thus, it is mathematically incapable of representing any TFP growth. Second, because CACM measures the costs of a BIAS network that does not provide actual BDS, either in geographic scope or service quality, there is no reason to believe that even if it was a dynamic model that it could measure TFP that is accurate as to BDS. Finally, the network CACM represents is imaginary, built instantaneously without regard to the history or location of past facilities deployments, save for a collection of pre-existing wire center locations. Therefore, there is no reason for its costs to bear any close resemblance to costs that will be actually incurred in producing future BDS. For these reasons and because the CACM-related input prices that Sprint proposes to employ are intentionally downward biased, Sprint's

[12] Supplemental Declaration, p. 5-6.
[13] Mark Schankerman and Pierre Régibeau, "Supplemental Declaration: Comments on the Frentrup-Sappington Report," October 6, 2016, pp. 9-11.
[14] Frentrup Declaration, p. 3.

argument that its proposal will be "forward looking" is even more strained. Indeed, Sprint appears to be arguing that its proposal is preferable because it was developed without any tether to actual productivity experience in the production of BDS. We see no virtue in this argument.

For all of the above reasons, we find that the methodological flaws in Sprint's proposed mix-and-not-match methodology for developing an X factor are fatal. It presents a computational and data use framework that is not recognizable as an optimizing economic model. Further, its inconsistencies are exposed when its logical implications are tested against empirical data whose validity is not in dispute. For these reasons, it cannot provide any guidance as to an appropriate special access X factor.

While we believe these fundamental flaws are fatal to any consideration of the Sprint proposal, we will go on to explain why, even if Sprint's methodology is accepted (and it should not be), Sprint's empirical implementation of this methodology is at best unreliable, and, more commonly, simply incorrect.

FRENTRUP FAILS TO ADDRESS FUNDAMENTAL PROBLEMS INHERENT IN THE CACM MODEL AND ITS RELATED DATA

The balance of Frentrup's Declaration discusses criticisms we raised concerning the accuracy of CACM-related input price growth rates. While Frentrup claims to address "all" of our "substantive" criticisms, this is not the case.[15] In fact, Frentrup fails to address the most major of the accuracy deficiencies we identified in the data Sprint proposes to use, and frequently fails to make appropriate corrections to these data for the errors that it does choose to address. As a result, Frentrup's Declaration does little to rehabilitate the Sprint proposal.

Because we have noted many of these criticisms in our three previous declarations, we will focus our attention on just the most egregious of the remaining data flaws and Sprint's newest adjustments.

Frentrup Fails to Address the Fact that CACM is not a Model of BDS Supply

The Frentrup Declaration fails to reconcile the fundamental differences between actual BDS supply and the hypothetical mass-market BIAS supplied by CACM. This is a message we have conveyed in each of our previous filings and is one cited by the Commission in the FNPRM when it noted the distinct differences in cost and service quality between BDS and mass-market BIAS.[16] Instead, the Frentrup Declaration chooses to ignore these significant differences and continues simply to assume, without support, that its CACM-related speculated input price growth rates match those actually experienced by BDS.

Frentrup Fails to Address the Fact that Sprint's CACM-Related Input Price Growth Rates are Based on Data that are Inferior to those Developed by the BLS and are Purposely Understated

We have repeatedly noted that the CACM peer review response ("CPRR") clearly warns that its posited input price growth estimates are highly imprecise, not based on "good" data, and that its growth rates were purposely chosen to understate actual input price growth. These disqualifying facts have been ignored by F&S, and now again by Frentrup.

[15] Frentrup Declaration, p. 3.

[16] Federal Communications Commission, Tariff Investigation Order and Further Notice of Proposed Rulemaking, WC Docket Nos. 16-143, 15-247, 05-25 and RM-10593, para 13.

We have documented that the input price growth rates from the CPRR are no better than rough assumptions and are not based on any year-by-year time series of actual BDS or BIAS price data.[17] Further, the CPRR states that these input price growths were selected not to provide unbiased estimates of CACM input price growths, but rather were deliberate underestimates to show that future ILEC costs for mass-market BIAS would not be less than CACM-based universal service support.[18] Our Supplemental Declaration also shows that empirical evidence from BLS statistics on Producer Prices and Labor Productivity growth within subsectors of the Broadcasting and Telecommunications industry strongly suggest that the CACM-related input price growth estimates posited by Sprint are inaccurate as to actual BDS or wired telecommunications experience and are distinctly understated. None of this empirical evidence has been disputed by F&S or by Frentrup.

As we have noted earlier, these flaws in the CACM-related price growth rates proposed by Sprint are fatal. Unless Sprint can produce cognizable evidence that shows these data to be accurate, reliable and reproducible, they should not be accorded any weight; and certainly cannot be considered superior to the input price growth estimates developed by BLS KLEMS.

Frentrup's Attempt to Fine-Tune CACM Input Prices is Incomplete, Irrelevant and Does Not Rehabilitate the F&S Proposal

Despite the multitude of red flags that the matching of CACM-related input prices with BLS KLEMS TFP is fundamentally misguided, Frentrup continues to fine-tune F&S' input price estimates. This exercise is futile and meaningless. Below, we note the deficiencies in Frentrup's fine-tuning, but reiterate that this is not meant to suggest that any amount of tinkering can rectify the fundamental flaws in F&S' approach of combining CACM-related input prices with BLS TFP to determine an X factor. F&S's decision to mix unmatched data sets, especially when one of these data set is incomplete and acknowledged to be inaccurate and biased, is a fatal flaw that no fine tuning can salvage. Rather, our observations about the manipulations that F&S and Frentrup apply to these unusable data are intended only to illustrate further deficiencies in the economic modeling contained in these Sprint declarations.

Focus first on capital prices. While Frentrup makes an attempt to address F&S' failure to account for cost of removal and salvage value, Frentrup still fails to properly develop the complete user/rental price for capital that is fundamental to KLEMS productivity analysis. As we noted in our Supplemental Declaration, the following deficiencies are either not addressed, or not correctly ameliorated:[19]

- The projection lives that F&S and Frentrup use from CACM documentation are not current. They reflect depreciation studies that are now more than twenty years old.[20] But assume these lives were correct for 1997. Current projection lives are much shorter.[21] This means that over

[17] See Supplemental Declaration, pp. 9-11; and Federal Communications Commission, Peer Review of Connect America Phase II Cost Model, FCC Response to Professor Christiaan Hogendorn, pp. 10-11..
[18] Federal Communications Commission, Peer Review of Connect America Phase II Cost Model, FCC Response to Professor Christiaan Hogendorn, p. 10.
[19] Supplemental Declaration, pp. 15-17.
[20] Supplemental Declaration, pp. 16.
[21] In its Securities and Exchange Commission Form 10-K Report, Sprint states that it employs lives that range between 3 and 30 years for buildings and improvements and network equipment, site costs and related software; and between 3 and 12 years for non-network software, office equipment and other (available at http://d1lge852tjjqow.cloudfront.net/CIK-0000101830/b6860cf8-0b1e-4897-9133-6663810ae7b8.pdf , p. F-14).

Sprint's proposed X factor test period of 1997-2014, projection lives were declining, which is extremely consequential for the rental/user price of capital. If projection lives are declining, the economic value of embedded capital is declining, and to compensate for this its rental/user price must increase. Neither F&S or Frentrup account for this component of capital's rental/user price. Indeed, this issue illustrates a larger problem with F&S' and Frentrup's capital price analysis: it is static. That is, Sprint assumes that CACM-related price growth rates are constant over the complete time period. Thus, if the posited CACM-related price growth for, say, electronics is -20% (Sprint's claimed "mid" estimate), Sprint's modeling assumes that it was -20% in each and every year of its test period. But there is no reason to believe that this is true. If this average growth rate masks the fact that electronics price growth rates were actually -30% in 1997, and declined smoothly to -10% in 2014, this would suggest a much different series of capital rental/user prices than an assumption of unvarying yearly change. Because KLEMS productivity models assume that firms adapt to input price growth rates as they occur, and not to assumed constancies over 20 years of time, one cannot expect that use of 20-year average assumptions will yield correct calculations.

- Despite our warnings, Frentrup still makes no attempt to account for changes in interest rates, other finance costs or possible changes in tax treatment of capital assets that may have occurred during the lengthy test period that Sprint proposes. Changes in these external variables are highly consequential to the economic rental/user price for capital.
- Frentrup also continues not to account for the economic revaluation of assets called for in the rental/user cost of capital that results from inflation or deflation in prices for new capital assets.
- Instead of taking our instruction to apply a proper, blended depreciation rate to land and buildings, Frentrup swings 180 degrees from F&S' improper decision to depreciate land and buildings at a depreciation rate associated with buildings, to not depreciating either land or buildings at all.[22]
- Finally, the weights used to develop F&S's and Frentrup's claimed index of capital input price changes remain based on the cost shares associated with a national run of the CACM model, and not based on the input cost shares that would have been implied by using the cost shares associated with actual BDS production or that correspond to the KLEMS cost shares associated with the BLS' development of TFP.[23]

Even more of a black box is F&S' and Frentrup's development of operating expense inputs. While it is impossible for us to fully evaluate these as the model underlying them is less transparent than the model underlying Sprint's capital input price adjustments, Frentrup appears to have misunderstood one of our criticisms. In particular, in our Supplemental Declaration, we noted that:

Note that none of these lives approach the 40 to 50 year projection lives for some CACM plant categories. Further, there are no projection lives in CACM that are less than 6 years, while Sprint's 10-K minimum is 3 years.

[22] Simple reference to the financial statements of large telecommunications providers such as AT&T or Verizon shows that Land tends to comprise no more than 5% to 10% of the entire Land and Buildings category. This suggests that a proper blended depreciation rate for the combined category should be a number modestly larger than the 40-year life assumed for buildings. Instead, Frentrup chooses to not to depreciate the entire category at all – even though 90% to 95% of it consists of depreciable buildings or other improvements.

[23] Indeed, as we noted earlier, many of the inputs used by the CACM to produce mass-market BIAS services are not used to provide BDS (e.g., ONTs, splitters); and many of the inputs used to provide actual BDS (e.g., copper) are not used in the CACM.

- Operating expenses for individually designed circuit special access services are unlikely to be similar to those associated with mass-market BIAS, and are likely to be much larger.
- F&S' mixing of a national CACM run for capital cost shares with a Large Urban figure for operating expenses will overweight the influence of capital and plant related opex input price changes and underweight the influence of non-plant-based opex price changes. Further, because F&S' Table 8 claims less growth in this first category of input prices than in the second, this results in a biased downward estimate of overall input price growth.

In response, Frentrup suggests that our criticisms can be addressed simply by replacing F&S' assumption of Large Urban network opex with opex based on a Large Rural network. This answers nothing. First, even though Large Rural network opex levels may be greater than Large Urban network levels, there is no demonstration that these levels approach the opex levels associated with special access. Second, Frentrup makes no effort to correct for the capital cost share bias resulting from use of a national CACM run rather than a run that focuses on the urban areas where BDS are most prevalent. Instead, Frentrup's response is to assume "two wrongs make a right" by combining inapposite national capex with inapposite rural opex. Finally, due to the opaque nature of Frentrup's X-factor adjustment model, we remain puzzled as to how applying an increased weight to non-plant-based opex (and thus a lesser weight to capital costs and plant-related opex) results in a larger X-factor as Frentrup claims it does.

Frentrup's tune-up of the F&S proposal also continues to ignore the fact that CACM-related input price estimates are wide-ranging and acknowledged to be understated. Combined, these deficiencies make Sprint's use of what it falsely claims are mid-point estimates misleading in terms of input price growth level and precision.[24] The calculations presented in F&S and Frentrup are not based on any precise measurement and are not tethered to accepted methodologies for productivity analysis. On the basis of their largely opaque manipulation of numbers, F&S arrived at a claimed "midpoint" estimate of input price growth of -0.09% (or -0.18% or -0.46% depending on which selection one makes from Frentrup's menu of "combined effect" estimates).[25] These growth rates are only 1.58 to 1.95 percentage points less than the 2005-2014 BLS figure of 1.49% developed using a proper year-by-year analysis and actual input price and cost data collected by the BLS for this industry.

The CPPR input price growth figures are acknowledged not to be based on good data, with stated errors of up to ±10 percentage points. Further, most of the growth rates provided in the CPPR are stated without any error range at all. It is easy to imagine that if the CPRR had assigned error ranges to these, they would have been at least ±2.5 percentage points. But even the "midpoint" figures claimed by F&S are known to be downwardly biased. As a result, if an actual unbiased midpoint figure was developed for these input price growth rates, it would easily be a figure that equals or exceeds the BLS KLEMS measurement of 1.49%.

In addition, there remains the unresolved question of how Frentrup's numerical manipulations actually arrive at so small a rate of overall input price growth. Consider these apparent facts: F&S claim that 59.6% of all capital costs are embedded labor, and that labor's share in opex costs is even higher, approaching 100% for some categories of opex. But if, as Frentrup now admits, labor input price growth should more appropriately match the BLS's figure of 3.49%, how does a weighted average between this labor price growth rate that constitutes the vast majority of opex and 59.6% of capex combine with

[24] Supplemental Declaration, p. 19.
[25] Frentrup Declaration, p. 6 and Table 2.

whatever price growth rate Frentrup surmises for the rest of capex and opex, and still yield a weighted average rate of between -0.09% and -0.46%? For this overall figure to hold, the input price growth rates for non-labor capital assumed by the F&S analyses must be astoundingly negative.

Finally, Frentrup fails to rebut our criticism of F&S' reasoning for using a test period beginning in 2001 (which is that this longer period is necessary to mitigate the impact of the Great Recession). As we previously noted, the recession period only accounts for three of the nine years during the more recent and relevant 2005-2014 period, but the differential in TFP growth between the industry and the overall economy was almost exactly the same in its recession years as in its non-recession years.[26]

In conclusion, Frentrup has only responded to a select subset of our criticisms regarding the F&S calculations. But even a comprehensive response to our data accuracy criticisms would still not be able salvage the irreparable F&S approach. Because of this, Frentrup's summary of his changes that he characterizes as the "Combined effects of all M&S critiques" is not correct.[27] There is no basis to attach any credence to figures developed by Sprint's calculations. The only valid measurement of a BDS X-factor is one developed by BLS KLEMS and shows the factor to be 1.99% over the 2005-2014 period.

[26] Supplemental Declaration, p. 19.
[27] Frentrup Declaration, p. 6.