Review of Dr. Rysman's "Empirics of Business Data Services" White Paper

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1. I am an Associate Professor of Economics (with tenure) at the University of Maryland College Park, and have previously served on the faculties of Northwestern University and Duke University. I received my PhD in Economics from MIT in 2004. My research is focused on empirical Industrial Organization, with a particular focus on market dynamics, market entry and product repositioning, auction design and the effects of mergers, including in media industries. My research has been published in *Econometrica*, the *Journal of Political Economy*, the *American Economic Review* and in several other leading journals. I have taught Ph.D. and undergraduate courses in Industrial Organization, as well as teaching Computational Economics at Ph.D. level and Econometrics to undergraduates. I am currently an editor of the *Journal of Industrial Economics*, a foreign editor of the *Review of Economic Studies*, a leading general interest economics journal, and an Associate Editor of the *Economic Journal*.

2. The market for Business Data Services (BDS) is a complicated mix of wholesale and retail, and regulated and unregulated businesses. In compiling this review I am relying in large part on the descriptions of the industry provided in Dr. Rysman's report as well as answers that FCC staffers have provided to my questions. However, conditional on this understanding, I believe that I am well-placed to comment on Dr. Rysman's analysis and his interpretation of the results. My bottom-line conclusion is that Dr. Rysman has made modeling choices that are generally sensible but that, partly because of the limitations of the data available, the results should be interpreted with some caution (as Dr. Rysman himself suggests in his conclusions), as it is possible that he is either under or overestimating the magnitude of market power. I make some specific suggestions for further analysis.

3. The structure of my report is as follows. In Section A I explain, in simple terms, the logic being used in Dr. Rysman's report and the assumptions being made. In Section B I discuss the possible limitations of the data that has been compiled by the FCC for this study. Some of these limitations follow directly from the complexity of the market that is being analyzed. In Section C I discuss Dr. Rysman's analysis of market structure (revenue and competitive presence at the building and census block level), before discussing his analysis of pricing in Section D. Section E concludes.

A. Framework

4. The objective of the white paper is to understand whether the market for BDS is close to competitive, in the sense that the market power of providers is limited. The focus is on ILECs which remain the dominant providers of BDS, at least for DS1 and DS3 services.

5. Understanding the extent of market power requires finding at what point rival firms will constrain an ILEC's pricing. Given that it is time consuming and costly to develop a copper or fiber network, it is reasonable that a competitor that is not present at all in a geographic area will not be able to compete for customers and will not constrain an ILEC's pricing to any significant extent. For providers that are present in a geographic area, the questions are to what degree they constrain ILEC pricing and how. For example, the mere presence of a rival may constrain an ILEC if it is concerned that the rival will respond to overpricing by aggressively signing up customers and rapidly deploying its services. Of course, if the ILEC is constrained by the threat of `potential entry', the rival may not actually build out its network and pick up many customers. On the other hand, if it is difficult for the rival to add links to its network (either because it is costly or it is slow to secure the required permissions), then even if a competitor serves a firm in an adjoining building it may be less effective at winning a customer, and it may also face a brand name disadvantage to a local ILEC. In either case, ILECs may be able to exercise significant market power, against at least some customers, even when there are competitors in close proximity.

6. As in most settings, the researcher of the BDS market does not observe barriers to rival expansion or the way that customers shop directly. Therefore, Dr. Rysman has

undertaken an approach that is quite standard in competition analysis. In one part of his analysis he has looked at whether rivals are present in close proximity to customers. If they were not present at all, then market power could be assumed in the absence of effective price regulation. However, the descriptive analysis of whether competitors are active in a building or a census block does not directly answer the question of whether this presence affects prices, or how much presence is required to get meaningful constraints on prices. Therefore, in another part of his analysis he looks at whether increases in measured competitive presence nearby is associated with lower ILEC prices.

7. The idea that is being used in the price analysis is straightforward. If the presence of competitors lowers ILEC prices and it is assumed that (a) the entry of competitors does not raise the incumbent ILEC's costs; and (b) the entry of competitors is not correlated with an ILEC having particularly high costs, then one can infer that without the presence of competitors the ILEC is able to raise its prices, i.e., to exercise market power. Given that the analysis uses cross-sectional data it is also necessary to make the assumption that entry of competitors is not more likely to happen where ILEC prices for BDS services would naturally be low, which might happen if there are areas where customers are more likely to purchase a wide range of ILEC products of which BDS services are simply a small part. Of course, if there was no finding that competition reduced prices, this result could be interpreted in various ways, and in the current setting this point is relevant for the high bandwidth services results. For example, no correlation with observed competition measures might be explained either by an ILEC who faces no observed competition actually having very limited market power or by a lot of observed competition actually having little effect on the market power faced by customers who remain with the ILEC.[1]

8. The approach adopted by Dr. Rysman is reasonable, but as this discussion suggests, it depends on assumptions, some of which are very difficult to test with the data available. I will suggest below some additional work that might shed light on some of these assumptions.

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[1] It could also, of course, be explained by the measures of competition simply not being very

B. Special Access Data

9. Dr. Rysman's report is based on data that was collected by the FCC from ILECs and their competitors (CPs). The dataset appears to be vast: containing details of all of the locations served by CPs and monthly information on individual accounts served by ILECs and CPs. However, the data has a number of limitations for answering the question at hand. I list them here, although many of them will come up again in subsequent sections.

a. The data comes from a one-year cross-section. This makes it impossible to conduct a `panel data'-type of analysis where one can try to understand how the price paid by a particular customer, or the type of service that a customer chooses to purchase, responds to changes in competition. Instead, the reliance is on cross-sectional variation in the extent of competition in different locations. Dr. Rysman has, sensibly, tried to address the obvious concern that there may be unobservable differences across customers that are correlated with both prices and competition by using census tract or county fixed effects. However, most economists would regard within-customer-over-time changes in prices, that could have been identified and estimated with panel data, as more compelling. In this particular setting, the fact there is only one year of data may create some additional issues. For example, many of the contracts observed are likely to have been negotiated some time prior to 2013, when local competition may have been different.

b. The data comes from 2013. It is likely that since 2013 there has been significant growth of fiber-based cable networks, and increases in the ability of `best efforts' cable service to compete for business customers. There may also have been changes in business demand for BDS as applications used by businesses have changed (for example, businesses may now conduct more activity over wireless networks, or use VoIP for their phone service). It is therefore possible that relationships observed in the 2013 data may hold more or less strongly today.

c. The price data only provide limited information on what end-user businesses pay for services that include BDS. For all three levels of service considered by Dr. Rysman (DS1, DS3 and high bandwidth) over 80% of ILEC customers are `telecommunications providers', who in most cases are likely to be packaging these services with other

products to sell as a `managed services' bundle to a final customer. Wholesale customers may also be buying other products from ILECs for the same locations that are not subject to price caps. From a welfare and regulatory perspective one would also like to know how much of any higher prices that can be subscribed to a lack of competition in the basic BDS market are passed through to final users; how a lack of competition in the basic BDS market may affect competition in the downstream market for managed services[2]; and, whether the prices of other products that telecommunications providers buy from ILECs move with or against the prices of basic BDS services.

d. It is not clear whether the data contain additional information on important terms and conditions that may affect pricing. For example, prices may be lower for longer contracts or with unusually high service guarantees, or they may be higher if the provider was required to install special equipment at the start of the contract that has to be paid for over the life of the contract. The summary statistics suggest huge heterogeneity in prices for the same nominal product (e.g., DS-3 prices range from $0.01 per month to $596,710.55 per month). While the log transformation of price used in the price regressions will tend to mean that extreme price outliers will have less effect on the coefficient estimates than would be the case if the regressions used prices in levels, there remains a concern that the comparisons being done may not be apples-to-apples. If any terms and conditions are available, one should analyze how they differ, within a census tract or county, with the level of competition, and, ideally, additional controls for terms and conditions should be included in the regressions. It may also be possible to identify customers who are buying connections in multiple locations from the same supplier to investigate whether there are volume discounts, and how discounts may vary with the level of competition. It may also be appropriate to control for the date a contract was signed if prices are typically fixed within a contract over time.

e. The data does not tell us directly about the price setting process. For example, customers may issue Requests for Proposals (RFPs), where they invite firms to submit tenders to provide the service. Even a small sample of RFPs and associated tenders may provide

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[2] A standard result from the analysis of vertical relationships is that a firm that has monopoly power at one level of a vertical chain would like to promote downstream competition in order to maximize its profits. See, for example, Tirole, *The Theory of Industrial Organization*, 1988, MIT Press, pp. 174-175.

important additional information on: (i) which firms view themselves and are viewed by customers as being potential competitors; (ii) whether CPs are able to meet the complete range of services requested by customers, and how this is affected by their presence in the building, census block or census tract; (iii) whether the decisions of customers about which provider to buy from are primarily driven by prices or by other factors; (iv) the willingness of customers to substitute between different levels of service (e.g., fiber to DS3, or DS3 to DS1). This would be important in assessing whether we would expect competition to have large effects on prices; which customers are likely to be picked up by new competitors that enter a particular geographic market; and whether there is some incumbency advantage for an existing supplier; and, (v) how often customers look to change their providers.

C. Dr. Rysman's Analysis of Market Structure

10. Section IV.A. and IV.B. of Dr. Rysman's report provide evidence on the revenues of BDS providers (at the national level; and, for ILECs, divided into revenues that accrue from their ILEC service areas and from other areas of the country where they are CLECs), and on the extent to which the data indicates that CPs can provide BDS service in individual buildings or individual census blocks.

11. The data indicate that companies that are ILECs account for the vast majority of BDS revenues and that this is also true when one looks at the market for both BDS and services for which BDS is an input (Rysman's Table 3). However, in the market for packet service BDS, which is likely growing, CPs account for a much greater share of revenues than in the market for more traditional circuit-based BDS.

12. Based on the framework discussed above, it is not clear that one can infer from measures of national market concentration that price competition is limited. For example, an ILEC company that is a CLEC in a given geographic area might compete quite aggressively with the incumbent ILEC for customers; or, the potential competition of small providers might discipline ILEC prices even if ILECs, possibly efficiently (because overbuilding networks with excess capacity will typically be inefficient), continue to account for the vast majority of customers served.

13. An important reason why ILEC-affiliated CLECs may not compete aggressively for customers is that they typically lease facilities from local ILECs. In particular, ILEC may be able to charge wholesale prices that are sufficiently high that it is difficult for a CLEC to undercut the ILEC in the downstream market if wholesale regulation is ineffective. However, it is also possible that regulated leased prices are, for some reason, set too low, which would place the leasing CLEC at some competitive advantage in the final market. I agree with Dr. Rysman that more analysis is required to understand whether CPs utilizing UNE or other leased products from ILECs to provide their BDS products are able to discipline ILEC pricing.

14. The reported measures of building and census block competition indicate that CPs do not serve 57% of building locations, and only serve 23% with their own facilities (Rysman, Table 4 and Table 7). Table 6 implies that the majority of service with own facilities comes from two companies, Time Warner Cable and Comcast Cable. These firms may primarily provide fiber connections, although this is not 100% clear from the analysis. At the Census block level, only 30% of blocks have one or more competitive providers (Rysman, Table 9).

15. The question of whether competition from a provider that is currently in the census block but not in a building is sufficient to constrain prices is, ultimately, an empirical question. However, given that many buildings may only have one business customer in them, so that there is only likely to be one connection in use, it is clearly slightly dangerous to infer that a lack of competitor presence at the building level indicates limited competition.

16. I was surprised by the fact that we see that 23% of buildings have CP own-facility presence, and only 30% of blocks have CP own-facility presence.[3] In an environment where there are more than a couple of business locations in a census block and customers do not switch providers or request connections that often, one might have expected that the proportion of buildings with CP presence to be much lower than the proportion of blocks with some CP presence. One might interpret the fact that these numbers are quite close as implying that, once in a census block, CPs are able to gain access to buildings

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[3] For example, if all census blocks have the same number of buildings, entered blocks have one CP, and that CP, on average, connects to half of the available locations, then one would expect the building penetration rate to be equal to one-half of the census block penetration rate.

and position themselves to make sales to customers quite effectively. This interpretation, if correct, would matter for how competition should be measured and promoted (i.e., the key would be to promote CPs building out into census blocks). With panel data one would be able to understand how quickly presence in census blocks can be translated into presence in buildings. With the available cross-sectional data it would be appropriate to look at how the build out to individual buildings varies with the size of the census block, possible impediments to build out (e.g., major roads) and the age of the CP connection.

17. It would be natural to extend the analysis of census block vs. building presence to examine how this varies with the geographic area of the block or the number of reported locations purchasing BDS services. In the price regression analysis it should also be possible to interact the block-level competition variables with area of the census block to see whether there is evidence of competition appearing to provide greater discipline on block prices when blocks are small.

D. Dr. Rysman's Analysis of Pricing

18. Section IV.C. of Dr Rysman's report looks at how ILEC prices are affected by various measures of CP competition using a multivariate regression framework using fixed effects to control for possible confounding heterogeneity at either the census tract or the county level. As explained by Dr. Rysman, the competition coefficients will then indicate whether prices are lower in census blocks or buildings with greater CP presence when we compare blocks within the census tract or county. The results broadly indicate the DS1 and, especially, DS3 prices are significantly lower when there is CP presence in the building and in the block. There are no clear results for high bandwidth connections, and I would be skeptical about trying to read too much into the subset of the coefficients that are significant for this type of service.

19. A cross-sectional price-concentration analysis inherently suffers from the possible problem that there is some unobserved factor that affects prices and is correlated with competition that may lead to a spurious relationship. Dr. Rysman's approach of using fixed effects and trying multiple specifications is exactly what one should do with this type of data, but it does not remove the problem entirely. In this setting one can imagine

scenarios that might mean that the framework employed will overestimate or underestimate the effects of competition on prices. For example, the effect of competition might be underestimated if (a) customers who are willing to pay for fancier products (or shop around less) attract more entry (leading to a positive relationship between price and competition); or (b) ILECs respond to competition by reducing some other component of customers bills while leaving the BDS component unchanged. On the other hand, some factors might work in the opposite direction. For example, CPs might be particularly good at picking off customers who want fancier services from the ILEC, so that in locations with CP competition, ILECs are left serving customers who are purchasing relatively cheap products, even if, for any given customer, the presence of a CP does not reduce the price that they pay for the service that they get. A priori, one cannot sign the biases that may be present.

20. While fixed effects are one (sensible) approach to dealing with the issue of unobserved heterogeneity, other strategies are sometimes possible. For example, in some situations one might be able to find an instrument for the degree of competition in a particular geographic area based on the historical development of CP networks.[4] An alternative approach might be to try to use a method such as propensity score matching so that one is comparing particularly similar customers who differ only in the degree of competition that they face. This technique can be valuable when there is significant heterogeneity in the type of customer that is observed across different geographies, although its implementation may require having more information on customers than is available in the current dataset.

21. A theme in the results is that the price-reducing effects of competition are largest for DS3 (although this is not true for every coefficient in every specification). One interpretation

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[4] A valid instrument is another observed variable that it is believed will have a significant effect on the probability that there are local CP competitors but would not be expected to have a direct effect on prices or to be correlated with unobservables that do affect prices. An estimation approach such as two stage least squares can use this instrument to consistently identify the effect of competition. As an example, a number of researchers that have examined how WalMart has affected local labor markets have used the distance of the location from Bentonville, AK as an instrument for when and where WalMart entered a location, reflecting the systematic way in which WalMart expanded across the country. See, for example, Basker, "Job Creation or Destruction? Labor Market Effects of Wal-mart Expansion", *The Review of Economics and Statistics*, 2005, 87(1), 174–183.

of this would be that many DS1 customers (who purchase a relatively low bandwidth/slow product) find substitution to a `best efforts' cable service, which may yield higher speed on average, a viable option; while ILECs have little incumbency advantage for customers who demand high bandwidth which cannot be supplied effectively over copper wire. DS3 customers, who pay for a service that is much more expensive than best efforts cable and much less expensive than business high bandwidth service may have few options available. An analysis of even a small sample of RFPs, as suggested above, might shed light on this issue.

22. For the analysis both the statistical significance and the magnitude of the coefficients may matter, i.e., market power may be too limited to rationalize regulation even without facilities-based competition even if the effects of competition are statistically significant. Dr. Rysman notes (p. 23) that some of the estimated effects (e.g., 28.6% or 23.2% price reductions for DS3 in areas with flexible pricing) may be "implausibly large", and they are certainly larger than the 10 or 11% effects in Table 14. It is not clear what the metric is being used or should be used for what is a reasonable effect of competition. Given that most of the costs of providing BDS are likely to be sunk when an ILEC has existing lines with sufficient capacity available and that facilities-based CPs and ILECs may be capable of providing very similar products to users, it is not implausible that prices should fall quite substantially when competition is introduced.[5] It may make sense to consider the size of the coefficients alongside engineering-based estimates of the costs and margins involved in providing BDS services.

23. A concern with the regressions in Dr. Rysman's report is that the standard errors have not been clustered. The current specification allows for the residuals (the part of log price that cannot be explained by the observed regressors and the fixed effects) to be heteroskedastic (i.e., for some to be much bigger than others) but it assumes that they are independent across observations. But, one might be concerned that there are some common factors, which mean that customers who are very similar or close geographically will get more similar prices than other customers. Clustering could potentially account for this in a way that is not achieved by the inclusion of fixed effects, and the common

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[5] In the extreme, benchmark case where marginal costs were zero and the products were completely undifferentiated one could rationalize a 100% price reduction when competition is introduced.

effect of performing clustering is that the standard errors increase. The increase can be small or it can be large, and without further analysis it is impossible for me to tell whether the increase in standard errors in this particular setting would be sufficient to render some of the coefficients statistically insignificant.[6] Dr. Rysman notes the clustering issue in his conclusion. I would recommend verifying that clustering does not have a large effect on the significance of the results before policy conclusions are drawn. The most natural way to cluster would be to choose a geographic unit such as a census block.

24. In the regressions the coefficients for different types of customer are typically highly statistically significant. For example, they indicate that telecommunications customers pay significantly lower prices, on average, for DS1 service. This could indicate either that they are buying different slightly different DS1 services to other customers or that they are better bargainers or negotiators. This might be explained by the knowledge of the market that a telecommunications provider is likely to have, or their ability to extract some type of volume discount if purchasing for many locations from the same provider. However, this bargaining power may also be affected by the level of competition: even a brilliant bargainer is only likely to be able to extract a lower price if they have credible alternatives to the ILEC, which might include facility-based CP competition. I would therefore recommend that a number of additional regressions are run where the sample is limited to different types of customers (e.g., one regression for non-mobile telecommunications provider customers, another for mobile phone customers, another for cable operators, another for non-telecommunicatons customers etc.). These additional regressions would serve to test whether the findings are robust, but it may also shed light on the mechanisms that lie behind the results and their welfare effects. For instance, if customers who are not telecommunications providers (and are therefore more likely to be final users) experience larger competition effects, this would indicate that ILECs are able to exercise much greater market power over these customers. It would also be appropriate to conduct a separate analysis of market shares for these types of customers.[7]

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[6] It is important to note that clustering will not change the coefficients themselves.

[7] Of course, alternative results and interpretations are possible. For example, suppose that the presence of CP competitors in the census block appears to have little effect on the prices paid by non-telecommunications customers. One explanation would be that, even when competitors are

One could also take this logic further. For example, it is likely that users who want a package of services for different locations may both negotiate and experience market power quite differently than single-location businesses. If customers can be separated on these dimensions one could also investigate whether there are differential competition effects.

25. More generally it may also be useful to add additional controls for the terms and conditions that different customers face or choose (e.g., the length of contracts, or the level of service guarantees). It is possible, for example, that these may vary with the level of competition (for example, when facing competition an ILEC may offer a large discount if a customer will sign a longer contract) and this may also, of course, be affected by the prevailing regulatory regime. For example, offering this type of discount may only be possible in markets where pricing has been partially deregulated. Once again, it is not clear to me exactly what terms and conditions are observed in the data, but I would recommend adding additional controls for contract terms if possible.

E. Conclusion

26. In my opinion, Dr. Rysman has made many sensible choices when analyzing the available data. His estimates support a finding that additional local competition reduces the prices of DS1 and DS3 services, and his view that this finding implies that ILECs have significant market power when they do not face local competition is not unreasonable given that there is no obvious reason why the presence of local competitors would increase an ILEC's costs. There are factors that have not been controlled for in Dr. Rysman's study, but it is quite possible that these are attenuating the effects that he has estimated rather than leading him to an incorrect conclusion that market power exists.

27. However, as I have indicated, there are scenarios under which these conclusions might be invalid, or at least limited to small sub-groups of customers. These scenarios include unobserved heterogeneity across geographical areas that is correlated with variation in

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present, ILECs are able to exercise monopoly power over these customers because many of them are not aware that these competitors exist, or they simply have very strong preferences for sticking with providers that they know.

competition; correlation across customers that, because it is ignored, is leading to standard errors that are too small; heterogeneity in how telecommunications providers and end user customers shop for BDS; and variation in the terms and conditions of BDS services that are created by competition but may not necessarily benefit customers (for example, being locked into longer contracts). The additional data analyses that I have suggested would allow the FCC to investigate these issues more thoroughly.