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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

DECLARATION OF KENNETH J. ARROW

December 22, 1998

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I. INTRODUCTION

A. Qualifications

1. I, Kenneth J. Arrow, am the Joan Kenney Professor of Economics Emeritus at Stanford University. I received my B.S. in Social Science from The City College of New York in 1940, my M.A. in Mathematics from Columbia University in 1941 and my Ph.D. in Economics from Columbia in 1951. I have taught economics at the University of Chicago, Harvard University and Stanford University, and I have written more than 200 books and articles in economics and operations research. I am the recipient of numerous awards and honorary degrees, including the Nobel Memorial Prize in Economics (1972). A significant part of my writing and research has been in the areas of economic theory, industrial organization and welfare economics. My curriculum vitae is attached as Appendix 1.

B. Overview of Conclusions

2. I have been asked by counsel for Bell Atlantic Corporation ("Bell Atlantic") and GTE Corporation ("GTE") to address claims in two broad areas that have been raised by various parties ("respondents") that have filed comments with the Federal Communications Commission ("the Commission") in opposition to the proposed Bell Atlantic/GTE merger. Specifically, I have been asked to review respondents' claims that:

- The proposed merger will substantially reduce the ability of regulators to monitor the performance of the merged firm and other incumbent local exchange carriers (ILECs) by reducing the number of available "benchmarks"; and
- The proposed merger will harm competition because it combines two large providers of local exchange and exchange access services, increasing opportunities for "coordinated interaction" and increasing Bell Atlantic/GTE's incentive to discriminate against rivals.

3. As I discuss in this declaration, respondents greatly exaggerate the risk that the proposed transaction will harm competition. Respondents' analysis of the proposed merger's effect on regulators' ability to use benchmarks to monitor ILECs' behavior contains numerous flaws.

- First, respondents fail to recognize that changes in the telecommunications industry during the last several years – in particular, the enactment and implementation of the Telecommunications Act of 1996 ("the 1996 Act") – have produced substantial numbers of new benchmarks for regulators to analyze in evaluating ILECs' performance.
- Second, respondents overstate the extent to which the proposed merger will reduce the amount of information available to regulators. In particular, the merger would not reduce regulators' ability to compare the quality of service that an ILEC provides to competitive local exchange carriers ("CLECs") with the service that the ILEC provides to itself.
- Third, the analysis submitted by Sprint's experts contains numerous shortcomings including, for example, the unsupported assumption that regulators are passive recipients of information. (My discussion here focuses on Sprint's experts because they present the most complete discussion among respondents' benchmarking analyses.[1])

4. Respondents' various claims that the proposed merger will reduce competition by combining two large providers of local exchange and exchange access services also exaggerate the risk of harm to competition.

- First, respondents' claim that the size of a merged Bell Atlantic/GTE will by itself reduce competition is without economic basis. Respondents, in effect, claim that "big

[1] In particular, my comments focus on: Declaration of Joseph Farrell and Bridger M. Mitchell, "Benchmarking and the Effects of ILEC Mergers," October 14, 1998, included as Attachment C to Sprint Comments (hereafter, Farrell and Mitchell).

is bad." This simple-minded antitrust theory was rejected long ago by economists and courts.

- Second, there is no merit to respondents' claim that a merger of Bell Atlantic and GTE increases the potential for "coordinated interaction" among providers of local telephone service, with the effect of reducing the likelihood of ILECs' entry into each others' territories. This claim ignores the fact that the proposed merger of Bell Atlantic and GTE has been accompanied by announcement of a major out-of-region entry strategy -- precisely the opposite of what would be expected under the mutual forbearance theories raised by respondents.
- Third, respondents' claim that the proposed merger will increase the merged firm's ability and incentive to discriminate against rivals by raising local access prices charged to long distance carriers is based on flawed economic reasoning that the FCC has rejected on several past occasions.
- Finally, respondents' claim that the proposed merger will increase the merged firm's ability and incentive to discriminate against rivals through non-price means is based on flawed economic logic and is inconsistent with market evidence.

II. RESPONDENTS EXAGGERATE THE IMPACT OF THE PROPOSED MERGER ON THE ABILITY OF REGULATORS TO ESTABLISH BENCHMARKS FOR EVALUATING ILEC PERFORMANCE.

5. Several respondents argue that the proposed merger should be blocked because it will reduce the ability of the Commission and other regulators to monitor the behavior of incumbent local exchange carriers. In particular, these respondents argue that the proposed merger will reduce the number (by one) of firms that can serve as "benchmarks" to assess the

performance of other regulated ILECs, thereby reducing substantially the ability of the Commission and other regulators effectively to monitor and regulate all such providers.[2]

A. Respondents Fail to Recognize that Changes in the Industry Have Produced Large and Growing Numbers of Benchmarks.

1. Regulators can now focus on whether ILECs provide service to rivals that is equal in quality to that provided to themselves. These benchmarks are unaffected by the proposed transaction.

6. Respondents' claims ignore the fundamental changes that have taken place in the telecommunications industry during the last several years. These changes, including the enactment and implementation of the 1996 Act and the widespread deployment of facilities and services by CLECs, have reduced the importance of the traditional types of benchmarks relied on in the past by the Commission and other regulatory bodies. Indeed, these changes are intended ultimately to reduce the importance and need for substantial regulation of all telecommunications providers, including ILECs.

7. Following the divestiture of the Bell Operating Companies (BOCs) from AT&T in 1984, regulators focused on the BOCs' provision of local access to interexchange carriers ("IXCs"). Because BOCs were prohibited from providing long-distance services, regulators could not compare how a BOC treated IXCs with how the BOC "treated itself" (e.g., how the BOC treated its own long-distance affiliate). The BOCs had a purely "vertical" relation to IXCs. That is, the BOCs supplied an input to, but did not compete with, IXCs. For this reason, how a particular BOC treated an IXC sometimes was compared to, or "benchmarked" against, how one or more other BOCs treated the same IXC. For example, federal and state regulators have used BOC-BOC benchmarks to detect discriminatory pricing, to evaluate equal access

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[2] See, for example, Petition to Deny of Sprint Communications Company L.P. ("Sprint Comments"), p. 46; Comments of MCI Worldcom, Inc. ("MCI Worldcom Comments"), p. 33; and Petition of AT&T Corp. to Deny Application ("AT&T Comments"), p.20.

requirements, and to ensure compliance with installation and maintenance requirements for various purposes.[3]

8. The importance of such BOC-BOC comparisons has decreased considerably, however, as the regulatory focus has shifted to how BOCs treat competitors in markets in which the BOCs themselves also compete. In such markets, the key inquiry is not whether the BOC is treating competitors as well as another BOC, but whether the BOC is treating competitors as well as it treats itself.

9. This was, for example, the main regulatory focus in the Computer III Inquiry in which the FCC adopted nonstructural safeguards to govern BOC participation in the Enhanced Services market. Here the Commission noted that it was adopting regulatory requirements to ensure that the BOCs "provide these competitors with access to basic services that is comparable in efficiency to the access they provide their own enhanced services."[4] The BOCs were required to provide "equal access" to competing enhanced services providers (i.e., comparably efficient interconnection ("CEI")), but, unlike in the long-distance context, the relevant regulatory inquiry with this form of equal access is whether the BOC is treating competitors comparably to itself. The Commission said: "In general. . . we require the basic service functions utilized by a carrier-provided enhanced service to be available to others on an unbundled basis, with technical specifications, functional capabilities, and other quality and operational characteristics, such as installation and maintenance times, equal to those provided to the carrier's enhanced services."[5] A BOC's CEI offering must be generally available with minimal transport costs, and fully operational and available prior to the date that the BOC offers its corresponding enhanced service to the public.[6] The BOCs were ordered to file quarterly

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[3] See United States v. Western Elec. Co., 993 F.2d 1572, 1580-81 (D.C. Cir. 1993).

[4] Amendment of Sections 64.702 of the Commission's Rules and Regulations (Third Computer Inquiry), Report and Order, 104 FCC2d 958, 1027 131 (1986) ("Third Computer Inquiry").

[5] Third Computer Inquiry, 104 FCC2d at 1036, 147. BOCs accordingly were required to provide interface functionality, unbundling of basic services, resale, technical characteristics, installation, maintenance and repair, and end-user access on a basis equivalent to its own enhanced services. Id. at 1039-1041, 157-162.

[6] Id. at 1041-1042 163-165.

reports comparing the level of service they provide to their enhanced service affiliates with the service they provide to their enhanced services competitors.[7]

10. Since the passage of the 1996 Act, the focus of regulatory efforts by the Commission and other regulators has shifted to issues of access by firms that provide local telephone service in competition with incumbent local exchange carriers ("ILECs"). That is, regulatory efforts are focused on how ILECs treat firms with which they have a "horizontal" relationship -- firms that buy inputs from, and compete with, ILECs.

11. The 1996 Act established a regulatory process under which CLECs can gain access to the local exchange facilities of the ILEC by signing an "interconnection agreement" with the incumbent carrier. The large number of interconnection agreements that ILECs have signed with CLECs has resulted in the creation of new benchmarks and considerable new information that regulators can use in evaluating an ILEC's performance. Between November 1997 and November 1998, the number of such agreements grew from roughly 1,700 to more than 5,400.[8] Bell Atlantic alone participated in 300 agreements in 1997 and an additional 450 in 1998.[9] The interconnection agreements are public and, as a result, their utility as benchmarks is enhanced. The criteria for evaluating an ILEC's performance in these agreements can be monitored not only by regulators, but also by the CLECs themselves.

12. These interconnection agreements facilitate benchmarking as they often establish specific performance standards and a detailed schedule of charges if ILECs fail to meet their commitments. Each interconnection agreement requires approval by the relevant CLEC, ILEC, and state regulatory agency. Specifically, in its Local Competition Order, the Commission interpreted the Act's requirement that ILECs provide CLECs "nondiscriminatory" treatment as a requirement that the ILEC provide competitors with access to its facilities on the

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7 Id., 104 FCC2d at 1055-1056 192.

8 USTA Competition Report, November 3, 1997 and information in USTA's December 9, 1998 letter to The Honorable Thomas Bliley, Chairman of the House Committee on Commerce. The letter states that "local telephone companies have successfully negotiated more than 5,400 interconnection agreements with competitors, doubling the amount of such agreements from just a year ago."

9 Ibid.

same terms and conditions as it provides for itself.[10,11] As a result, an ILEC's performance in providing access to a CLEC with which it has signed an interconnection agreement can be compared with the ILEC's performance with respect to its own local customers. Since there is no reason to expect that the proposed merger between Bell Atlantic and GTE would lead an ILEC to provide poorer service to itself, the proposed merger would not be expected to reduce the usefulness of this internal benchmark.

13. Finally, it is worth noting that the FCC and the Department of Justice ("DOJ") in evaluating BOC applications to provide long-distance service under Section 271 of the 1996 Act compare ILEC-CLEC benchmarks, not ILEC-ILEC benchmarks. In evaluating BellSouth's Section 271 application in Louisiana, for example, both the DOJ and FCC compared the service provided by BellSouth to CLECs with the service BellSouth provided itself for a number of services, including pre-ordering, ordering, and maintenance and repair functions.[12]

2. The widespread deployment of facilities and services by CLECs creates alternative benchmarks regulators can use in evaluating ILEC performance.

14. The entry of numerous CLECs into local markets (a situation that is now occurring throughout the country) correspondingly creates a variety of alternative benchmarks for evaluating an ILEC's performance, since the service that the ILEC provides to one CLEC can be used to evaluate its performance against others. For example, the share of LATAs in which one or more local service competitors hold numbering codes has increased from 11

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[10] FCC, Notice of Proposed Rulemaking in the matter of Performance Measurement and Reporting Requirements for Operating Support Systems, Interconnection and Operator Services and Directory Assistance. CC Docket 98-72, at 6.

[11] Pursuant to such agreements, CLECs, for example, may obtain access to the same "OSS functions" that ILECs rely on to provide retail services to their own customers. CLECs are entitled to access customer data needed in order to sign up local exchange customers; place orders for services or facilities; receive relevant billing information from the ILEC; and so on.

[12] Evaluation of the U.S. Department of Justice in the Matter of the Second Application by BellSouth Corporation, Bell South Telecommunications, Inc., and BellSouth Long Distance, Inc. for Provision of InterLATA Services in Louisiana, pp. 28-35; and, FCC Memorandum Opinion and Order in the Matter of the Second Application by BellSouth Corporation, BellSouth Telecommunications, Inc., and BellSouth Long Distance, Inc. for Provision of InterLATA Services in Louisiana, pp. 61, 71, 92-93.

percent in the third quarter 1995, to 34 percent in the third quarter of 1996, to 64 percent in the third quarter of 1997 to 84 percent in the third quarter of 1998.[13]

15. The CLECs entering into these agreements include each of the major respondents or their subsidiaries. For example, as of November 1997, AT&T and its subsidiary TCG had entered to interconnection agreements in 36 states and were involved in arbitrations in another five states. Similarly, MCI Worldcom (including its MFS and Brooks Fiber subsidiaries) had entered into interconnection agreements in 40 states; Sprint CLEC subsidiaries have signed interconnection agreements in 22 states. These firms have the incentive and expertise to monitor their interconnection agreements and to evaluate the performance of the various ILECs with which they have signed interconnection agreements.

16. The proposed transaction can also be expected to create significant new regulatory benchmarks. Out-of-region CLEC subsidiaries created by ILECs appear to be especially well-placed to monitor the performance of in-region ILECs. Sprint, for example, acknowledges that "[a]nother large incumbent is far better able to assess and contest claims by an ILEC that one form of interconnection is not feasible, or too costly, and thus the product of these negotiations can be expected to produce more efficient arrangements for competitive entry."[14]

17. In sum, the increasing number of CLECs and individual interconnection agreements with the CLECs create many benchmarks for regulators to use in evaluating the performance of ILECs in serving CLECs.

18. Furthermore, because all interconnection agreements are made public, agreements signed in one state can also influence the terms of agreements signed in other

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[13] FCC, Industry Analysis Division, Common Carrier Bureau, Local Competition, December 1998, Table 4.2. Assignment of a number code indicates that a CLEC is licensed to provide service in an area but does not necessarily indicate that the carrier yet provides service. If a reserved code is not activated with 18 months, the codes will be released from reservation. (Id., p. 41).

[14] Sprint Comments, p. 12.

states. That is, regulators in one state can, and do, monitor interconnection agreements signed in other states. For example:

- As a result of negotiations with MCI, Bell Atlantic agreed that performance measurements included in MCI's interconnection agreement with Bell Atlantic in Pennsylvania would be included in MCI's interconnection agreement with Bell Atlantic in Virginia. Bell Atlantic also agreed that these performance measurements would be included in MCI's interconnection agreements in each (pre-NYNEX merger) Bell Atlantic state.[15]
- In a proceeding concerning performance standards for Bell Atlantic relating to interconnection agreements, the Pennsylvania Public Utilities Commission, at the urging of NextLink, considered the arrangements set by the Massachusetts Public Service Commission. The Pennsylvania PUC noted that "[c]ertain of the observations of the Massachusetts Public Service Commission are well-taken."[16]
- In a proceeding concerning whether Bell Atlantic should be required to provide directory assistance (DA) database access to competitors, MCI filed a petition urging the New Jersey Board of Public Utilities to follow the rulings of the Virginia, Maryland, and Delaware Commissions. The New Jersey Board granted MCI's petition and ordered Bell Atlantic to provide "the same DA database transfer that is now being provided in Virginia and other jurisdictions, or one which is substantially the same."[17]
- Rhode Island adopted a Stipulated IntraLATA Presubscription Plan (ILP) that, according to the Rhode Island PUC, is "essentially a verbatim borrowing from the

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[15] Brief of Bell Atlantic pp. 17-18; MCI Telecommunications Corp. v. Bell Atlantic Corp., File No. E-98-32 (FCC filed October 2, 1998).

[16] See PA PUC April 10, 1997, Application of MFS Intelenet of Pennsylvania, Inc.; Application of TCG Pittsburgh; Application of MCI Metro Access Transmission Services, Inc.; Application of Eastern Telelogic Corp.

[17] See New Jersey Board of Public Utilities May 15, 1998, RE Investigation Regarding Local Exchange Competition for Telecommunications Services.

New Hampshire Public Utilities Commission's order on ILP, initiating presubscription in that state on June 2, 1997."[18]

- In a similar proceeding, the Vermont Public Service Board adopted a Stipulated ILP that "is based on the Stipulated ILP Plans approved in Rhode Island and Maine, and also the plan that was initially filed by NYNEX in New Hampshire."[19]

19. The benchmarking process today is enhanced further still because under the terms of the 1996 Act, each ILEC must offer the equivalent of "most favored nation" protection to all CLECs in the same state.[20] That is, the ability of one CLEC to successfully negotiate and implement interconnection agreements benefits all other CLECs.

B. Respondents Overstate the Extent to Which the Proposed Merger Will Reduce the Amount of Information Available to Regulators.

20. Even for issues for which ILEC-ILEC comparisons (instead of ILEC-CLEC comparisons) may be relevant, respondents overstate the percentage reduction in the number of benchmarks resulting from the proposed merger because they ignore non-BOC ILECs. In particular, independent LECs, including Sprint's LEC subsidiaries, AllTel, Frontier, Cincinnati Bell and others, can provide benchmarks for regulators.

21. Sprint's experts Joseph Farrell and Bridger M. Mitchell ("Farrell and Mitchell"), in their discussion of the role of benchmarking, indeed cite a Commission evaluation of collocation charges that relied on information from 14 LECs, including "Cincinnati Bell Telephone Companies, Lincoln Telephone and Telegraph Company, Rochester Telephone Corporation, and Central Telephone Companies."[21] Similarly, the Commission's Statistics of Communication Common Carriers ("SOCC") reflect data not just from the five major BOCs, but from a large

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[18] See Rhode Island PUC April 18, 1997, RE IntraLATA Presubscription Plan.
[19] See Vermont PSB August 20, 1997, re: New England Telephone and Telegraph Company.
[20] 47 USC §252(i)
[21] Farrell and Mitchell, p. 23.

number of "Tier 1" carriers, LECs that collect more than $100 million in annual operating revenues.[22]

22. Sprint's comments express concern that its new ION technology will face discrimination by ILECs, but fail to mention that its own local exchange operations can be used to provide a benchmark for evaluating the success of ION's implementation in other regions. Sprint operates more than 7 million access lines including ILECs in Las Vegas, NV and Raleigh, NC.

23. Furthermore, respondents overstate the extent to which the merger will reduce the amount of information available to regulators since many measures of firm performance are specific to states and/or operating companies, not simply to the parent or holding company. Regulators often rely on state-level data, as opposed to holding company-level information, in evaluating an ILEC's performance. Since Bell Atlantic and GTE both have operations in only a limited number of states, the proposed merger is unlikely to have a significant effect on these types of data and comparisons. Interconnection agreements, for example, are typically negotiated on a state-by state basis, and ILEC adherence to these agreements is generally evaluated on state-by-state basis. Similarly, the performance monitoring reports that Bell Atlantic provides to CLECs pursuant to the Bell Atlantic/NYNEX order may not cover an area larger than a single state.[23] In addition, much of the data in the SOCC are reported for each LEC on a state-by-state basis.

24. Similarly, regulators also often rely on information reported at the operating company level (as opposed to simply relying on data at the holding company level). Thus, some information collected by the Commission on Bell Atlantic's performance aggregates information for several states but still does not aggregate these data with information from the service areas formerly served by NYNEX. For example, the Commission in a recent case relied on

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[22] Non-BOC Tier 1 ILECs include Alliant Telecommunications, AllTel, Cincinnati Bell, Frontier and Sprint.

[23] See FCC Memorandum Opinion and Order in Bell Atlantic/NYNEX, Appendix C(1)(i).

information from 15 operating companies including SBC's SouthWestern Bell Telephone Co. (which provides service in Texas, Oklahoma, Arkansas, Missouri and Kansas), SBC's Pacific Bell and Nevada Bell units, Bell Atlantic North (formerly NYNEX), Bell Atlantic South (the original Bell Atlantic states), as well as various non-RBOCs.[24]

25. Similarly, Farrell and Mitchell cite various FCC decisions that rely on operating company-level information. In addition to the Commission evaluation of collocation charges discussed above (which relied on information from Pacific Bell and Nevada Bell, among others), Farrell and Mitchell discuss regulators' use of operating company-level data for benchmarking charges for collocation-related services and for shared transport issues.[25]

26. The Automated Reporting Management Information System ("ARMIS") reports, which regulators often use to compare ILECs, also are based on state or operating company data. The ten ARMIS reports, filed by BOCs and non-BOCs, contain financial and operating information for each reporting ILEC.[26] Because these data are reported at the state-specific level or on an operating company basis, these data would not be affected by the proposed transaction.

C. The Analysis of Sprint's Experts Farrell and Mitchell Is Based on Unsupported Assumptions and Other Flaws.

27. Sprint's experts, Farrell and Mitchell, claim that "[t]he loss of one of a relative handful of large ILECs would substantially damage efficient regulation, including the interconnection regulation necessary for the growth of competition in local exchange and

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[24] In re 1998 Annual Access Tariff Filings: Southwestern Bell Telephone Company Revisions to Tariff F.C.C. No. 73, footnote 2.

[25] See Farrell and Mitchell, at p. 16, fn. 23, and p. 18.

[26] These data include cost information for both regulated and nonregulated activities; as well as operating data on the installation and repair intervals achieved for service to IXCs, business customers and residential customers; trunk blockage; switch downtime; outages greater than two minutes; the results of customer satisfaction surveys; quantities of local switches according to type and by capability; interoffice facilities; the quantity of all access lines in service; the growth of access lines in service; the time it takes to deliver calls to an IXC using various types of switching and signaling systems; statistical schedules of switched access lines by customer and by technology; and telephone calls and minutes of use.

exchange access markets."[27] This conclusion is based on unsupported assumptions and other flaws. First, Farrell and Mitchell's analysis of average-practice benchmarking is based on the unwarranted assumption that each ILEC is an "independent observation." Second, Farrell and Mitchell assume that regulators are, in effect, passive recipients of information and cannot respond to changes in the type or amount of information as a result of industry mergers. Third, Farrell and Mitchell's analysis of "best practices" benchmarks fails to recognize that a merger affects the information available to regulators only under very specific circumstances.

1. Farrell and Mitchell's analysis of the effect of the merger on average practice benchmarking is flawed.

28. Farrell and Mitchell's analysis of average-practice benchmarking is based on the assumption that, in a statistical sense, each ILEC provides an "independent observation." That is, they assume that information from one ILEC provides no information about other ILECs. Farrell and Mitchell provide no basis for this assumption. Indeed, there are several reasons why the information available from different firms will not be independent observations, but instead will be statistically correlated. Farrell and Mitchell acknowledge that "different ILECs' capabilities for productivity improvement are highly correlated, because many of the same technological opportunities, new products, and demographic trends apply to all."[28] But Farrell and Mitchell do not incorporate this observation into their analysis. That is, they fail to note that when information from different ILECs is highly correlated, the loss of one observation results in little loss in the total amount of information available to regulators.

29. Furthermore, even accepting Farrell and Mitchell's assumption of "independent observations," the analysis is misleading for a variety of technical reasons. I discuss these additional shortcomings of their analysis in Appendix 2.

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[27] Farrell and Mitchell, p. 48.
[28] Farrell and Mitchell, p. 10.

2. Farrell and Mitchell's analysis assumes that regulators are passive recipients of information.

30. Farrell and Mitchell give examples of some of the consequences of mergers for various types of benchmarking. Each of these examples, however, implicitly assumes that regulators will not respond to whatever changes in the amount and quality of information result from industry mergers. However, regulators can alter their methods in response to any information loss; such actions by regulators will reduce the impact of any lost information. Thus, Farrell and Mitchell's examples define a worst-case scenario in which regulators continue all benchmarking practices unchanged despite a change in the environment in which the regulators operate.

31. For example, Farrell and Mitchell argue that merger decreases the incentive for a merged firm to improve efficiency.[29] If the X-factor (reflecting the rate of efficiency improvements in price cap regulation) is calculated by averaging the performance of all firms, efficient behavior by one firm will, in effect, penalize itself as well as other firms. They suggest that the merger will reduce the merged firms' incentive to act efficiently since the calculated X-factor will depend more heavily on its own performance.

32. This analysis, however, fails to take into account the likely response by regulators to this circumstance. If regulators conclude that the disincentives toward efficient behavior are too large, they could choose to base the X-factor only on information from rivals, or instead could incorporate an adjustment to the X-factor to respond to possible changes in firms' incentives. In other words, Farrell and Mitchell's conclusion that consumers will be harmed presumes that regulators passively react to information they receive and do not adjust their interpretation in response to changed circumstances.

33. Likewise, Farrell and Mitchell claim that the proposed merger will adversely affect consumers by making regulators' "rules of thumb" less effective mechanisms for protecting a consumer's interest. Farrell and Mitchell, for example, discuss a "mean plus one standard

[29] Farrell and Mitchell, p. 39.

deviation rule" whereby regulators might set a regulated price somewhat (e.g., one standard deviation) above the average, recognizing that "some LECs may reasonably provide service less efficiently than other LECs." Farrell and Mitchell claim that the Commission used such an approach in regulating prices that ILECs can charge to CLECs for collocating equipment at the ILEC's central office. Farrell and Mitchell point out that a reduction in the number of firms increases the standard deviation even if the mean is unaffected, increasing this threshold relative to the mean (e.g., resulting in a higher regulated price).[30]

34. However, there is again no reason to believe that a regulator would passively maintain a "mean plus one standard deviation" rule as circumstances change (e.g., as the number of observations on which estimates are based decreases). Instead of using a "conservative" rule based on the "mean plus one standard deviation," the regulator in such circumstances could respond by using a more aggressive rule based on the mean alone, or perhaps "mean plus one-half a standard deviation."

35. More generally, Farrell and Mitchell's example highlights why a regulator would make adjustments to respond to a reduction in available information as opposed to remaining passive and maintaining its existing procedures. Given regulators' ability to adjust their rules, it is by no means certain that a reduction in the number of ILECs will result in weaker regulatory performance standards that substantially harm consumers.

3. Farrell and Mitchell's analysis overstates the effect of the merger on best practice benchmarking.

36. Farrell and Mitchell claim that the proposed merger will adversely affect the ability of regulators to utilize "best practice" benchmarking, whereby regulators "use a 'best' practice offered by one ILEC to learn what is possible for all and require all ILECs to implement it."[31]

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[30] Farrell and Mitchell, p. 35.
[31] Farrell and Mitchell, p. 14.

Farrell and Mitchell's discussion of this practice focuses on local number portability and other factors that facilitate the entry of CLECs.

37. In many instances, however, a merger will have no effect on a "best practice" benchmark. In order for a merger to result in a less beneficial "best practice," three criteria must all be satisfied:

- One of the parties to the merger must be the firm with the "best practice."
- No party outside the merger has the "best practice" available.
- Given that one of the merging parties has the best practice, the merged firm must adopt a different practice.

38. If the firm has a strong incentive to adopt the best practice, then a merger may not result in the adoption of a less beneficial "best practice." Bell Atlantic, for example, faces strong incentives to adopt best practices that facilitate CLEC entry since such actions are necessary to win and keep authority to provide long-distance service under Section 271 of the 1996 Act. Farrell and Mitchell have presented no evidence supporting their assumption that the merging parties would choose not to adopt a best practice that facilitates CLEC entry. If one or both of the merging firms is using a best practice, then moving away from this practice would be readily recognized by regulators.

39. Moreover, as suggested above, a merger would not affect identification of a best practice in a variety of cases in which the merging parties did not posses such a practice or shared this practice with another firm.

III. RESPONDENTS' CLAIMS THAT COMBINING TWO LARGE PROVIDERS OF LOCAL EXCHANGE AND EXCHANGE ACCESS SERVICES WILL SUBSTANTIALLY REDUCE COMPETITION ARE WITHOUT MERIT.

40. Several respondents argue that the proposed merger should be blocked because a merger of two large providers of local exchange and exchange access services will

substantially reduce competition. Respondents claim that the merger will lead to a reduction of competition for several reasons.

- First, several respondents appear to believe that the large size of a merged Bell Atlantic/GTE will by itself reduce competition.
- Second, respondents argue that the proposed merger increases the potential for "coordinated interaction" among major ILECs.
- Third, respondents claim that the proposed merger will increase the merged firm's ability and incentive to discriminate against rivals by raising local access prices.
- Finally, respondents claim that the proposed merger also will increase the merged firm's ability and incentive to discriminate against rivals through non-price means.

This section shows that these claims are without merit.

A. There is No Economic Basis for Respondents' Claim that the Proposed Merger Will Harm Competition By Creating a Large Firm.

41. Respondents appear to believe that a merger of Bell Atlantic and GTE will reduce competition simply by creating a large firm. For example, MCI Worldcom argues that "[t]he sheer size and reach of a mega-BOC like Bell Atlantic-GTE would give the combined entity enormous power to block competition for local exchange carriers."[32] Similarly, AT&T claims that "[t]hese latest mergers, by giving the combined entities even greater pools of access and other monopoly profits from which to entrench their bottleneck monopolies ... and by establishing a market structure in which the nation's access lines may be largely divided between, in effect, a Bell East and a Bell West, would strengthen [the] barriers [to competition] even more."[33]

42. There is no economic basis for these claims. Respondents' statements reflect little more than an unsubstantiated suggestion that "big is bad." This simple-minded antitrust theory was rejected long ago by economists and courts.

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[32] MCI Worldcom Comments, p. 13.
[33] AT&T Comments, p. 2. See also, for example, e.Spire Comments, p. 3; Focal Communications Comments, p. i.

43. Even if Bell Atlantic and GTE were monopolists in their own territories (and, as I have discussed, each faces a variety of new competitors and has signed a large number of interconnection agreements with CLECs, and this competition is growing), simply combining two local monopolies serving distinct areas would not increase market power in either territory.[34]

44. Second, to the extent that respondents claim that Bell Atlantic/GTE's larger size alone will increase the ability of the merged firm to "block competition," they do not explain why this would have an incremental effect on Bell Atlantic and GTE's ability to prevent entry by CLECs. That is, they provide no explanation regarding how an increase in the size of these firms resulting from a horizontal combination of Bell Atlantic and GTE's ILECs will increase the merged firm's purported ability to "block competition" in its service areas. Indeed, there is no theory or facts to support such an assumption.

B. Respondents' Claim that the Proposed Merger Increases the Likelihood of "Coordinated Interaction" Ignores that the Transaction Will Result in Significant Out-of-Region Entry and New Competition for Respondents.

45. Respondents argue that the proposed merger will reduce competition by increasing the likelihood of "coordinated interaction" (i.e., collusion) among major ILECs in telecommunications markets. For example, according to MCI Worldcom, "[t]he proposed Bell Atlantic-GTE merger alone would significantly increase the likelihood of coordinated interaction. It will make it much easier and more likely for the few remaining major ILECs to continue the non-aggression pact under which they do not compete in each other's regions."[35]

46. Respondents ignore that the Bell Atlantic/GTE merger is motivated by the firms' desire to compete to provide bundled services on a national basis, including by providing service outside their existing service territories. This will directly result in increased competition

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[34] The extent to which Bell Atlantic and GTE are "potential competitors" in each other's territories is addressed in the Reply Declaration of Robert H. Gertner and John P. Gould.

[35] MCI Worldcom, at 30. A similar point is made by smaller CLECs including, for example, Focal Communications, p. 4; State Communications, p. 13, and KMC Telecom Inc., p. 9.

between Bell Atlantic/GTE and other major ILECs. If, as respondents claim, the major ILECs ever had a "non-aggression pact," the proposed merger and related out-of-region strategy surely indicate it no longer exists.

47. Respondents present no support for their claim that the Bell Atlantic/GTE transaction will inhibit out-of-region entry.[36] Any claim that the transaction would result in a "non-aggression pact" among ILECs should necessarily be viewed as highly suspect coming from MCI WorldCom, AT&T and Sprint, the principal rivals of the ILECs. These firms would be the principal beneficiaries of any such "non-aggression pact" because they will not face competition from ILECs in providing packages of services to various customers throughout the U.S. The success of any attempt to collude would require their participation, and respondents do not -- and cannot -- contend that they (or the many other CLECs) will participate in "coordinated interaction" that will lead to non-competitive outcomes.

48. Instead, MCI WorldCom, AT&T and Sprint are the leading firms in the provision of packages of local, long-distance and data services. These are precisely the firms that Bell Atlantic/GTE plans to challenge through their merger. The Bell Atlantic/GTE Application explains that the merger will enable them to compete more effectively in providing local, long-distance and data services for large business and other customers across the United States and internationally. These are precisely the customers and services on which MCI WorldCom, AT&T and Sprint appear to be focussing their marketing effort. The respondents' complaints are better understood as a response to concerns that Bell Atlantic/GTE will create a potent new competitor that will challenge respondents.

49. Moreover, a "non-aggression pact" involving ILECs alone agreeing not to enter each others' territories would not be effective without the participation of other CLECs who clearly would not benefit from participating in any such agreement. As discussed above, a significant number of CLECs are now deploying facilities and offering services. CLECs as a

[36] These claims imply that Bell Atlantic and GTE have attempted to mislead regulators, investors and elected officials in outlining their plans to deploy an out-of-region strategy.

group already are gaining share from the major ILECs. For example, CLECs have installed more access lines than ILECs over the last two quarters.[37] Similarly, former Commission Chairman Reed Hundt predicts that CLECs will increase their market share by five percentage points per year, and the CLEC trade association has projected a 25 percent national share of local access lines by the year 2003.[38] Such an increase in competition from CLECs would make a purported "non-aggression pact" among the BOCs largely ineffective as these CLECs continue to deploy facilities rapidly throughout the United States.

50. The great heterogeneity of firms now competing to provide local services and bundled services would greatly complicate any attempt to engage in "coordinated interaction." For example, major ILECs like a merged Bell Atlantic/GTE will have a greater presence in some regions of the country than others. In contrast, AT&T, MCI Worldcom and Sprint currently have customers throughout the country. Many other CLECs have a regional presence and differ significantly with respect to the mix of large business, small business and residential customers they serve. Other CLECs also differ in the type of technology they plan to use and the extent to which they plan to lease, resell, or construct their facilities. Thus, future telecommunications markets likely will be characterized by a substantial number of firms with heterogeneous characteristics. It is widely recognized that "coordinated interaction" typically is not a concern under such conditions. Moreover, the respondents' arguments ignore that these many and varied firms that compete with ILECs today include some of the largest telecommunications firms in the world: AT&T, MCI WorldCom and Sprint.

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[37] J. B. Grubman and S. McMahon, Salomon Smith Barney Research Industry Note, May 6, 1998.

[38] TR Daily, December 2, 1998 (http://www.tr.com/newsletters/trd/index.htm).

C. Respondents' Claim that the Proposed Merger Will Increase the Merged Firm's Ability and Incentive To Engage in a "Price Squeeze" by Raising Prices Charged to Rivals for Local Access Is Without Merit.

51. Respondents claim that the proposed merger will increase the merged firm's ability and incentive to discriminate against rivals by raising local access prices. For example, AT&T argues that "[s]o long as Applicants continue to exercise market power over exchange access, a necessary input for providing long-distance service, they can subject their long-distance competitors to price squeezes."[39]

52. Respondents' price squeeze arguments have been made, evaluated, and rejected several times. For example, in its investigation of the Bell Atlantic/NYNEX merger, the Commission concluded that "we believe that price squeeze tactics are likely to fail under the circumstances presented here as a predatory tactic aimed at eliminating competition among interexchange competitors."[40] Similarly, the same argument was rejected in the Commission's recent SBC/SNET decision. The Commission explained that "MCI made the identical argument in opposing the merger of Bell Atlantic and NYNEX. In the Bell Atlantic/NYNEX Order, the Commission concluded that this concern did not justify blocking the merger, and MCI does not challenge the Commission's analysis in this proceeding."[41] These arguments center on the regulatory safeguards in place and the corresponding ease with which this type of discrimination could be detected.

53. Respondents' claims have been rejected in the past because they are based on flawed economic reasoning. According to AT&T, "[t]he opportunity to impose a price squeeze exists because Applicants' access services are priced well above cost. . . . When Applicants provide long-distance services, however, they will not pay these inflated access costs."[42] However, this "price squeeze" argument ignores that when a local access provider also provides

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[39] AT&T Comments, p. 30.
[40] FCC, Bell Atlantic/NYNEX Order, ¶117.
[41] FCC, SBC/SNET Order, ¶24.
[42] AT&T Comments, p. 31.

long-distance service, it gives up any supposedly "inflated access costs." The same is true for a local access provider that offers "new services" that rely on local access. That is, if a local access provider can charge a price for local access that exceeds its cost of providing local access, then such a firm that also sells long-distance or other services that involve the use of local access faces an "opportunity cost" when it, instead of a rival, makes a sale of one of these services. In particular, the local exchange provider loses any profit associated with making a sale of local exchange access to a rival long-distance provider.

D. Respondents' Claim that the Proposed Merger Will Increase the Merged Firm's Ability and Incentive To Discriminate Against Rivals by Non-Price Means Also Is Without Merit.

1. Respondents' discrimination theory is based on contradictory assumptions.

54. Respondents claim that the proposed merger also will increase the merged firm's ability and incentive to discriminate against rivals by non-price (technological) means. In particular, Sprint's experts Michael L. Katz and Steven C. Salop stress this claim.[43]

55. The theory of discrimination put forward by respondents is based on two contradictory assumptions. On the one hand, the theory presumes that customers of the merged firm will be able to detect the discrimination and service degradation resulting from ILECs' actions -- otherwise they would have no incentive to switch from the rival's service to that provided by the discriminating carrier. On the other hand, the theory presumes that regulators and rivals (including large sophisticated firms like the respondents) will be unable to detect such discrimination and service degradation. If regulators and rivals could detect such behavior, ILECs would not be likely to discriminate because they would likely be subject to significant regulatory penalties and potential antitrust violations.

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[43] See, for example, Sprint Comments, p. 28 and Katz and Salop, p. 17. Related points are made in comments from AT&T (p. 12) and MCI WorldCom (p. 38).

2. Evidence in wireless telecommunications and other markets indicates that ILECs do not have the ability and/or incentive to discriminate in providing local access to rivals.

56. Respondents' claims that ILECs have the ability and the incentive to discriminate in providing local access services to rival suppliers is inconsistent with available empirical evidence. For example, ILECs provide critical inputs to competing cellular carriers; however, a review of the evidence in the wireless telecommunications industry contradicts respondents' claim that ILECs can successfully discriminate against their rivals.

57. From the introduction of cellular telephone service in the mid-1980s, to the introduction of ESMR and PCS services in the last few years, virtually all areas in the country were served by two cellular providers. One of the cellular licenses in each area was originally given to the ILEC in that area, and the second license was awarded to a "non-wireline" carrier. Both cellular providers relied on the ILEC to provide local access services (e.g., to connect a cellular call to a landline phone). That is, the ILEC provided local access services to a firm with which it competed.

58. If respondents' non-price discrimination concerns were valid, I would expect that the non-wireline carriers would have been substantially disadvantaged as they competed with the ILEC-owned cellular carrier. However, non-wireline carriers have for many years competed on an equal footing against ILEC-owned cellular providers. The Commission, for example, noted in 1996 that "the market shares in each cellular service area have been divided on a roughly equal basis between wireline and nonwireline carriers."[44] Furthermore, the actions of Pacific Telesis and U.S. West in divesting their cellular interests in 1994 and 1998, respectively, also are inconsistent with respondents' claim that an ILEC can disadvantage rivals that rely on the ILEC for local exchange access services.

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[44] Amendment of the Commission's Rules to Establish Competitive Service Safeguards for Local Exchange Carrier Provision of Commercial Mobile Radio Services, Notice of Proposed Rulemaking, Order Remand, and Waiver Order, 11 FCC Rcd 16,639, 16,664 47 (1996).

59. The success in recent years of PCS and ESMR providers that compete with ILECs' wireline cellular services provides further evidence that ILECs cannot successfully discriminate in providing local exchange access services to downstream rivals. For example, the advent of PCS services has lead to substantial declines in cellular prices, including those charged by ILECs' cellular subsidiaries. A May 1998 analysis of the pricing of wireless services noted that the average price for 30 minutes of use per month "fell an amazing 20 percent in just six months" between September 1997 and March 1998.[45] Again, these circumstances suggest that ILECs do not have the ability to discriminate against rival firms to which they supply a key input.

60. Similarly, I am aware of no claims of harm to competition resulting from RBOC provision of information services and customer premises equipment (CPE) in competition with others. For example, information services (including the Internet) have grown at extraordinary rates in recent years. RBOCs are small players among a very large number Internet Service Providers. Similarly, Bell companies have achieved only a modest share of industry sales of CPE.[46]

3. The widespread deployment of CLEC facilities is inconsistent with respondents' discrimination concerns.

61. The widespread deployment of competitive local facilities using a variety of new technologies also contradicts respondents' claims that ILECs have the ability and incentive to discriminate against rivals in providing local access. For example, Teligent and Winstar have deployed fixed wireless technologies in competition with ILECs; firms such as AT&T/TCI, Time Warner Communications and Cox Communications are deploying cable-based local services; Level 3 is deploying local service based on Internet Protocol; and a variety of other firms, including Focal, GST, Hyperion, ICG and others are deploying switch-based local networks

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[45] Paul Kagan Associates, Competitive Rates in Wireless Telecom May '98, A Comprehensive Guide to the Rates in the Top 100 U.S. Markets, May 1998, p. 12.

[46] NATA, 1995 Telecommunications Review and Forecast, p. 128 (1995).

throughout the country. As discussed above, AT&T/TCG and MCI WorldCom (through MFS, Brooks Fiber, and MCI Metro) have the most extensive CLEC operations in place, with each operating in a large number of cities.

62. Respondents' actions also are inconsistent with their professed concerns that ILECs will discriminate in providing local exchange access services. For example, Sprint recently announced widespread deployment of its "ION" technology, which relies on local exchange access from ILECs. According to Sprint, deployment of ION will require the development of new types of interconnection. This action is inconsistent with the discrimination concerns expressed by Sprint.

4. Respondents greatly overstate the extent to which the proposed transaction would increase incentives for ILECs to discriminate against rivals.

63. Even if an ILEC could, without detection, discriminate technologically against potential rivals of long-distance or local exchange services, the proposed merger will not increase any incentives to discriminate unless, and only to the extent that, the benefits of such discrimination could be captured in the expanded geographic territories of the merged firm. For example, if discrimination by GTE would harm rivals only in areas where Bell Atlantic has little or no presence, the proposed merger would have little or no effect on GTE's incentive to discriminate, even under respondents' theory.

64. Assume, for example, that GTE had the ability to discriminate against a rival CLEC operating in its California service area. Under respondents' theory, the proposed transaction would increase its incentive to do so only if this CLEC also operated in Bell Atlantic's territory. Thus, even if geographic economies of scope are important in these businesses, the proposed Bell Atlantic/GTE merger would increase the incentive to discriminate only against potential rivals that had significant assets in both Bell Atlantic and GTE territories.

65. But a variety of CLEC competitors do not fit this mold. For example, CLECs such as GST and ICG operate in at least one of the five largest MSAs in which GTE operates, but do

not appear to operate (or have plans to compete) in Bell Atlantic's territory.[47] Similarly, several other CLECs, including Hyperion, Focal and Covad, plan to operate in Bell Atlantic's territory but do not appear to do so (or have plans to do so) in GTE's five largest MSAs (or instead operate only in Los Angeles).[48]

66. More generally, any incremental incentive to discriminate due to CLECs operating in both Bell Atlantic and GTE's service area is likely to be small because many of GTE's territories are sparsely populated. As a result, GTE has faced considerably less CLEC entry than Bell Atlantic.[49] Even under respondents' theory, a merged Bell Atlantic/GTE would not have a greater incentive to discriminate against CLECs that focus their initial efforts in areas served by either Bell Atlantic or GTE, but not both.

67. The proposed merger also would not have a substantial "spillover" for long-distance services. According to respondents' theory, the merger would affect the incentive to discriminate against long-distance rivals to the extent that it would increase the merged firm's ability to capture "spillovers" resulting from such discrimination.

68. According to Sprint's theory, discrimination by an integrated provider of long-distance and local services against rival long-distance providers in one region will discourage customers in other regions from obtaining services from their rivals. Discrimination will benefit the integrated firm if the customers adversely affected by discrimination turn to it (the integrated firm) to obtain long-distance service. Thus, according to respondents, the incentive to discriminate increases when an integrated firm can provide end-to-end service for a greater share of calls. They claim, in turn, that the proposed transaction increases the risk of discrimination by increasing the number of end-to-end long-distance calls that the merged firm can provide.

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[47] This analysis is based on a review of SEC filings by various CLECs.

[48] GTE is the ILEC for portions of the Los Angeles MSA, including Santa Monica, Long Beach, and Pasadena. Covad and Focal offer, or plan to offer, service in Los Angeles. I have not investigated whether they plan to serve customers in GTE's operating areas.

[49] See various measures of local competition presented in USTA's December 9, 1998 letter to The Honorable Thomas Bliley, Chairman of the House Committee on Commerce. GTE, for example, has considerably fewer resold lines than any of the RBOCs.

69. The proposed transaction, however, would result in only a modest increase in the number of calls for which the merged Bell Atlantic/GTE could provide both originating and terminating service. According to Sprint, "the new firm would terminate 43% of the minutes that it controls on the originating end, which compares to a weighted average of 36% for the two companies separately."[50] That is, Sprint claims that the merger will increase the aggregate percentage of long-distance calls originating and terminating in the same ILEC's territory by seven percentage points. Even if Sprint's calculation is correct, the Commission has previously found that an increase "of only six to seven percentage points" in the percentage of calls served at both ends by one firm raises no competitive concerns.[51]

70. Furthermore, even if there were important "spillover" effects across ILEC territories, it does not follow that the merger will increase the merged firm's incentive to discriminate against rivals. In a simple model using the assumptions that are most favorable to the Katz and Salop theory, I show that a merger need not lead to an increased incentive to discriminate against CLECs. I explain my analysis in Appendix 3.

71. Finally, respondents fail to recognize that, even if all of their discriminatory concerns were valid (and as I have explained, they are not), and discrimination could make non-ILECs less effective competitors, the merger would add Bell Atlantic/GTE as a competitor in these markets. The addition of a new competitor in some or all of these markets (e.g., long-distance) could more than offset any reduction in competition resulting from any technological discrimination.

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[50] Sprint Comments, p. 33.
[51] See SBC/PacTel Merger Order, ¶53.

IV. SUMMARY OF CONCLUSIONS

72. Respondents ignore the fact that the dramatic industry changes in recent years have produced a substantial number of new benchmarks for regulators to analyze. In particular, an ILEC's performance in serving a CLEC can be compared with the ILEC's performance in providing service to itself. This type of benchmark is already used routinely and the proposed transaction would not limit its usefulness. Moreover, regulators' ability to adjust regulatory decisions can mitigate any loss in information that might result from the proposed merger.

73. Respondents' claim that the proposed transaction will reduce competition by combining two large providers of local exchange and exchange access services also exaggerates the risks of harm to competition. For example, their claim that the large size of Bell Atlantic/GTE alone will harm competition simply reflects the long-ago discarded antitrust notion that "big is bad."

74. Respondents' claim that the proposed transaction will result in "coordinated interaction" and a "non-aggression pact" ignore the simple fact that the proposed Bell Atlantic/GTE merger was accompanied by plans for significant out-of-region entry. If there ever was a non-aggression pact, recent events surely indicate that it no longer exists.

75. Respondents' claim that the proposed transaction will result in a price squeeze has been made and rejected previously. They introduce no new arguments suggesting that prior dismissal of these arguments are based on faulty economic reasoning.

76. In addition, respondents exaggerate the risks that the proposed merger will increase risks of discrimination by Bell Atlantic/GTE against its CLEC rivals. Available evidence on the success of non-wireline cellular providers, new PCS/ESMR wireless suppliers, information service providers and CPE providers indicates that concerns about ILEC discrimination against rivals are exaggerated. Similarly, the large-scale deployment of facilities by CLECs also is inconsistent with respondents' claims about ILECs' incentive and ability to discriminate. Finally, the theoretical arguments advanced by respondents that the proposed

transaction will result in increased incentives to discriminate are based on the self-contradictory proposition that discrimination will be significant enough to deter consumers from using the ILECs' competitors but not be detectable by regulators. In addition, respondents present no evidence that the changes in incentives they discuss are empirically significant.

I hereby declare, under penalty of perjury, that the foregoing is true and correct to the best of my knowledge and belief.

Kenneth J. Arrow

APPENDIX 1

BIOGRAPHICAL SKETCH

KENNETH J. ARROW

Personal

Born: 23 August, 1921
Wife's name: Selma
Children: David Michael and Andrew Seth

Education

B.S. in Social Science, City College, New York, 1940. Major: Mathematics.
M.A., Columbia University, 1941. Field: Mathematics.
Ph.D., Columbia University, 1951. Field: Economics.

Positions

Captain, U. S. Army Air Corps, 1942-46 (Weather Officer).
Research Associate, Cowles Commission for Research in Economics, 1947-49.
Assistant Professor of Economics, University of Chicago, 1948-49.
Consultant, the RAND Corporation, 1948-date.
Acting Assistant Professor of Economics and Statistics, Stanford University, 1949-50.
Associate Professor of Economics and Statistics, Stanford University, 1950-53.
Professor of Economics, Statistics and Operations Research, Stanford University,1953-68.
Economist, Council of Economic Advisers, U. S. Government, 1962.
Visiting Professor of Economics, Massachusetts Institute of Technology, Fall, 1966.
Fellow, Churchill College (Cambridge, England), 1963-64, 1970, 1973, 1986.
Guest Professor, Institute for Advanced Studies, Vienna, June 1964, June 1970.
Professor of Economics, Harvard University, 1968-74.
James Bryant Conant University Professor, Harvard University, 1974-79.
Joan Kenney Professor of Economics and Professor of Operations Research, Stanford University, 1979 to 1991.
Senior Fellow by Courtesy, Hoover Institution on War, Revolution and Peace, 1981-94.
Part-time Professor, European University Institute, 1986.
External Professor, Santa Fe Institute, 1988 to date.
Joan Kenney Professor of Economics Emeritus and Professor of Operations Research Emeritus, 1991 to date.
Fulbright Professor, University of Siena, Spring 1995.

University and Faculty Administration at Stanford University

Executive Head, Department of Economics, 1953-6
Member and Chair, Executive Committee of the Academic Council
Acting Executive Head, Department of Economics, 1962-3
Member and Chair, Advisory Board
Member and Chair, Senate of the Academic Council
Director, Stanford Institute for Theoretical Economics, 1991-93
Director, Stanford Center on Conflict and Negotiation, 1993-5

Honors and Awards

Gold Pell Medal (highest grades), City College, New York, 1940.
Phi Beta Kappa.
Social Science Research Fellow, 1952.
Fellow, Center for Advanced Study in the Behavioral Sciences, 1956-57.
John Bates Clark Medal, American Economic Association, 1957.
LL.D. (honorary), University of Chicago, 1967.
M.A. (honorary), Harvard University, 1968.
Marshall Lecturer, Cambridge University, Spring 1970.
D.Soc/Eco.Sci. (honorary), University of Vienna, 1971.
LL.D. (honorary), City University of New York, 1972.
Nobel Memorial Prize in Economic Science, 1972.
John R. Commons Lecture Award, Omicron Delta Epsilon, 1973.
D.Sci. (honorary), Columbia University, 1973.
D.Soc.Sci. (honorary), Yale University, 1974.
Dr. (honorary), Universite Rene Descartes, 1974.
LL.D. (honorary), Hebrew University of Jerusalem, 1975.
LL.D. (honorary), University of Pennsylvania, 1976.
D.Pol.Sci. (honorary), University of Helsinki, 1976.
Member, National Academy of Sciences (Chairman, Section 54, 1976-1979, Council member 1990 to date).
Fellow, American Academy of Arts and Sciences (Vice President, 1979-80, 1991-94).
Member, American Philosophical Society.
Member, Institute of Medicine.
Foreign Honorary Member, Finnish Academy of Sciences.
Corresponding Member, British Academy.
Sigma Xi (President, Stanford Chapter, 1981-82).
Tanner Lecturer, Oxford University, Spring 1983.
2nd Class Order of the Rising Sun, Japan, 1984.
Tanner Lecturer, Harvard University, Spring 1985.
Dr. of Letters, University of Cambridge, 1985.
Dr. Honoris Causa, Universite d'Aix-Marseille III, 1985.
von Neumann Prize of The Institute of Management Sciences and the Operations Research Society of America, 1986.

LL.D. (honorary), Washington University in St. Louis, 1989.
Clarendon Lectures, Oxford University, November 1989.
LL.D. (honorary), Ben-Gurion University of the Negev, 1992.
Member, Pontifical Academy of Social Sciences.
Laurea (honoris causa) Universita Cattolica del Sacro Cuore (Milan)
Dr. (hon.) Università del Sacro Cuore, 1994.
Dr. (hon causus) University of Uppsala, 1995.
Publication of Enduring Quality Award 1995, Association of Environmental and Resource Economics (with Anthony C. Fisher)
Kampe de Feriet Award (Information Processing for Management under Uncertainty), 1998
Medal of the University of Paris, 1998

Professional Societies

Econometric Society (Fellow; Vice President, 1955, President, 1956, Member of the Council, 1983).
Institute of Mathematical Statistics (Fellow).
American Statistical Association (Fellow).
American Economic Association (Member, Executive Committee, 1967-1969; President-elect, 1972; President, 1973; Distinguished Fellow).
The Institute of Management Sciences (President, 1963; Chairman of the Council, 1964).
Western Economic Association (President, 1980-1981).
American Association for the Advancement of Science (Fellow; Chair, Section K, 1982).
International Society for Inventory Research (President, 1983-1988).
Honorary President, International Economic Association; President 1983-1986; Member, Executive Committee, 1986-1992.
The Society for Social Choice and Welfare, Caen, France, First President, 1992-93.
Economists Allied for Arms Reduction, Co-Chair, 1990-1995

Business Positions

Member, Board of Directors, Varian Associates, Inc., 1973-1991
Member, Board of Directors, Abt Associates, Inc., 1975-1985
Member, Board of Directors, Fireman's Fund Insurance Company, 1980-1991

PUBLICATIONS OF KENNETH J. ARROW

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Appendix 2

TECHNICAL EXPLANATION OF WHY FARRELL AND MITCHELL'S "AVERAGE-PRACTICE" ANALYSIS IS MISLEADING

Farrell and Mitchell's numerical example assumes that the number of firms monitored by regulators falls from eight to four. Their characterization of the loss of information due to this reduction is misleading. Although the number of observations in Farrell and Mitchell's hypothetical example falls by a factor of two, the variance of each observation (now the sum of two observations instead of one) falls by the same amount.[1] Regulators have fewer pieces of information, but each piece is more reliable. Thus, neither the estimated average performance nor the true *classically defined* variance of these benchmarks will change at all.

Farrell and Mitchell use the increase in the Bayesian posterior variance as a measure of the fall in confidence that a regulator would have in the estimated benchmark. In this context, the posterior variance grows because the variance is not known, and due to their assumption of an uninformative prior distribution.

Although their calculations are numerically correct, Farrell and Mitchell greatly exaggerate the practical significance of these calculations. First, their small assumed sample sizes (eight firms merging to four) give the most dramatic results possible with respect to the posterior variance. Among examples in which the number of firms is cut in half, and for which the posterior variance can be computed, the "eight-to-four" example yields the largest change in posterior variance because the denominator in the calculated variance includes the term "n-3". In fact, as sample size grows, the posterior variance tends to the classical variance, which remains unchanged. This is particularly noteworthy as the numbers they choose are a poor reflection of the actual benchmarking environment. As I have discussed, the number of entities useful for benchmarking is considerably larger than the number of major ILECs. Second, their

1. As discussed in Section II.C above, this hypothetical and its underlying assumptions are not appropriate for analyzing the proposed transaction.

assumption of an uninformative prior distribution is unreasonable. Prior information exists in the form of the history of prior benchmarks, and from other sources. Given prior information on the variance, the posterior variance would not fall as dramatically. Indeed, if the variance is known from prior experience, the problem becomes the same as in classical statistics, and the merger has no effect on the posterior variance.

Appendix 3

EFFECT OF MERGERS ON INCENTIVES TO DEGRADE SERVICE TO COMPETING LOCAL EXCHANGE CARRIERS

The Declaration of Michael L. Katz and Steven C. Salop claims that the incentive of ILECs to degrade service to a CLEC would be increased by merger. In the following, I use the assumptions most favorable to their case, although I do not believe they are accurate. I assume that there are two ILECs. Because of economies of scale, the CLEC would not find it profitable to enter just one. It would have to enter both markets to cover costs and make a profit. In the absence of a merger, each ILEC could degrade service or not. (For the purposes of the present argument, I am assuming their freedom to do so, although it is hardly reasonable, since it is in effect assumed that the customers can tell the difference in service while the CLEC cannot enforce its desire for high-quality interconnections.)

It is conceivable that degradation of service by one ILEC will reduce demand for the services supplied by the CLEC so much that it will not enter. In this case, the merger will clearly have no effect, since the CLEC's entry will have already been deterred. Therefore, to give the Katz-Salop argument its best chance, suppose that degradation by one ILEC will not prevent entry but that degradation by both will. This appears to be the best case for arguing that the merger will increase the incentives for degradation.

But this inference is not correct if the firms are at all rational. To put the matter simply, each firm will degrade assuming the other is rational enough to understand that it is in its interest to degrade also. No collusion is needed, just a common understanding of the possibilities for deterring entry through degradation by both.

Formally, let A and B be the two ILECs, and let C be the potential CLEC. Let s_A be the decision of firm A, "degrade," or, "not degrade," abbreviated as "d" and "not d," respectively. Similarly, let s_B be the decision of firm B, with the same abbreviations. Finally, let C's strategy, s_C, be "not enter" or "enter," abbreviated as "not e" and "e," respectively. Let P_A, P_B, and P_C be the payoffs to A, B, and C, respectively. P_A depends on s_A and s_C, P_B depends on s_B and s_C,

and P_C depends on all three strategies. Clearly, $P_C(s_A, s_B, \text{not } e) = 0$ no matter what the strategic choices of A and B are. Our assumptions about the effects of degradation on the profitability of C's entry can be written,

$P_C(s_A, s_B, e) > 0$ if either s_A = not d or s_B = not d.

$P_C(d, d, e) < 0$.

We suppose that firms A and B make their strategic choices independently; then C decides whether or not to enter. Clearly, it will not enter if both firms have decided to degrade and will enter otherwise. This policy of C's can be anticipated by A and B. The decisions of A and B are taken to follow the principle of the Nash equilibrium. That is, A and B make choices such that neither would find it beneficial to change if the other does not. Clearly, the situation in which both firms degrade would be an equilibrium. If A degraded and B did not degrade, then C would enter, certainly making B worse off. The same argument applies from A's point of view.

To be complete, one would have to ask if there are other equilibria. It is true that there is another equilibrium in which neither A nor B degrade. In that case, it would not pay either to degrade since C would enter anyway. But clearly both A and B would be better off in the first equilibrium, on the assumption that degradation without C's entry is preferred to non-degradation with C's entry. Hence, the first equilibrium would certainly be chosen by both A and B, since each is aware that the other can see the value of degradation by both; in technical terms, the equilibrium in which both degrade Pareto-dominates the equilibrium in which neither degrades.

It is clear, then, that if it were possible to degrade service, whatever incentive there might be to do so would already exist without the merger. Hence, the merger in no way changes the incentives to degrade service.