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CompTel ASCENT

October 1, 2004

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

Re: *Cingular/AT&T Wireless Merger, WT Docket No. 04-70*

Dear Ms. Dortch:

CompTel/ASCENT ("CompTel") presents the attached merger simulation study to supplement CompTel's earlier comments opposing this merger, and to assist the Commission with its analysis of this transaction. If, as many (including Chairman Powell) contend, wireless and wireline service are substitutes for one another,[1] then the present merger bears careful scrutiny. While arguing against the notion of wireless substitution in this proceeding, it is notable that SBC and BellSouth have asserted the opposite in earlier proceedings before the Commission.[2] CompTel's attached merger simulation study is consistent with other economic analyses of this merger, all of which

[1] See, *e.g.*, Statement of Chairman Powell on Release of Interim Rules, CC Docket No. 01-338 (August 20, 2004) ("Consumers are using wireless telephones more than they are using wired telephones today—many now use their mobile as their primary phone."). See also, *"And a Child Shall Lead Them"* Remarks of Chairman Powell at the Chicago Economic Club, Chicago, Illinois (December 18, 2003) ("Many young people, for example, are cutting the cord and not subscribing to a local or long distance home telephone service. Instead, they have made their wireless phone, with its highly personalized attributes, their only phone.")

[2] See, *e.g.*, *Comments of SBC Communications*, CC Docket No. 01-338 at 38 (April 5, 2002) ("wireless networks built to serve high end customers initially are now being used to offer a portable substitute for wireline service.") See also, *Comments of BellSouth Communications*, CC Docket No. 01-338 at 22 (April 5, 2002) (FCC must consider intermodal competition "particularly with regard to wireless substitution" in assessing whether competitors are impaired without access to UNEs). Many of the Bell Company filings in CC Docket No. 01-338 claim that wireless and wireline are effective intermodal competitors. See, *e.g.*, Shelanski Declaration accompanying the comments of SBC and BellSouth in the above-referenced proceeding at ¶ 59 ("Switching Appears Yet More Competitive in Light of Wireless Competition"). But see, Affidavit of Richard J. Gilbert filed on Behalf of Cingular and AT&T Wireless, WT Docket No. 04-70 (March 18, 2004), ¶¶ 40-41.

demonstrate a substantial likelihood of significant losses in consumer welfare as a result of the combination of Cingular and AT&T Wireless. Significantly, but not surprisingly, CompTel's simulation, as well as the other studies, only confirms the accuracy and wisdom of BellSouth CEO and Chairman Duane Ackerman's two-years-ago, pre-merger, observation: "Wireless substitution is now a fact. That's okay. We tend to own both."[3]

Nonetheless, however harmful the potential effects of this merger may be, CompTel believes that this merger application presents the Commission with an opportunity to further the long-term policy goals of the Commission without excessively obstructive regulatory action. As CompTel has explained earlier in this proceeding, and explains in greater detail in the attached study, one critical factor which exacerbates the anticompetitive effects of this merger and continues to frustrate the deregulatory goals of this Commission is the anticompetitive behavior—exercised through term and volume special access tariffs—in which the Bell companies engage to foreclose and limit efficient facilities-based competition in the market for wholesale metro transport.

CompTel believes that much of the potential harm of this merger could be mitigated if the Commission would condition its approval of the merger on the elimination of certain anticompetitive provisions that currently exist in BellSouth and SBC term and volume tariffs. Specifically, the FCC should forbid SBC and BellSouth from imposing:

1) Termination, or "shortfall," liabilities that extend beyond the initial term of the volume tariff discount;
2) Volume commitments based on significant percentages of prior purchase requirements;
3) Discounts—especially "first dollar" discounts—predicated on moving circuits off competitive carrier networks;
4) Any restrictions which discourage special access purchasers from using their own fiber facilities, the facilities of a third party, or unbundled network elements from BellSouth or SBC.

These limited conditions will, along with prudent unbundling policies, help to more quickly expand economic opportunities for fiber-based wholesale carriers, the services of which will ultimately benefit all facilities-based providers—retail and wholesale, intermodal and intramodal. Exactly two years ago, Chairman Powell accurately summarized the economic benefit of the competition the Bells currently impede through the exclusionary terms their market power allows them to extract from both wireless and wireline competitors:

> "Only through facilities-based competition can a competitor lessen its dependency on an intransigent incumbent, who if committed to frustrate entry has a thousand ways to do so in small, imperceptible ways.

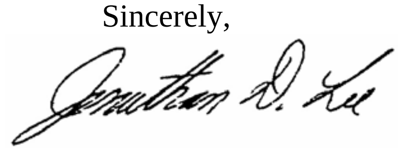
[3] *More Callers Cut off Second Phone Lines for Cellphones, Cable Modems,* WALL STREET JOURNAL B1 (November 15 2001) (quoting Duane Ackerman).

> Only through facilities-based competition can an entity bypass the incumbent completely and force the incumbent to innovate to offset lost wholesale revenues.
>
> Only through facilities-based competition can our Nation attain greater network redundancies for security purposes and national emergencies."[4]

CompTel shares the Commission's vision that consumers deserve all the benefits of vigorous competition between firms using both intermodal and intramodal technologies. This vision, however, cannot be realized unless, or until, retail competitors—of all technologies—have a genuinely competitive wholesale market for key inputs like local transport. SBC and BellSouth have locked down this market—starving alternative facilities providers of the demand they need to successfully expand competitive fiber deployment. This merger will not only be anticompetitive for consumers in the short run, but will enhance the Bells' ability to foreclose efficient facilities-based wholesale competitors—causing harm to nascent intermodal competition—unless the FCC steps in to protect competition.

Fortunately, though, this merger also presents the opportunity for the FCC to demonstrate its commitment to facilities-based intermodal (and intramodal) competition by eliminating anticompetitive strategic conduct by the incumbent monopolies that are a critical barrier to entry by fiber based wholesale carriers. Moreover, the additional competition that the Commission will spur through these limited conditions will inure to the benefit of retail wireless and wireline competitors, and their customers, but also retail providers of the nascent VoIP and BPL services the Commission seeks to further promote. Finally, the conditions CompTel proposes are fully consistent with sound antitrust principles, and provide the least intrusive means for the Commission to limit the anticompetitive effects of the proposed merger.

Sincerely,



Jonathan Lee
Sr. Vice President
Regulatory Affairs

[4] Remarks of Chairman Powell, Goldman Sachs Communicopia XI Conference, New York, NY (October 2, 2002).

A Simulation Analysis of the Effects on Mobile and Wireline Prices of the Cingular-AT&T Wireless Merger

I. Introduction

On February 17, 2004, formal terms were announced for the merger of the second and third largest mobile telecommunications carriers in the United States -- Cingular and AT&T-Wireless.[1] The combined market share of the two firms will equal about 40%, which is about ten percentage-points higher than the current largest mobile carrier Verizon (with about a 30% market share).[2] The merger will also place about 70% of mobile telephony subscribers in the hands of dominant wireline carriers (i.e., the Bell Operating Companies).[3]

There has been considerable debate over the consequences of the proposed merger for end-user prices. An expert hired by Cingular and AT&T-Wireless contends the merger "will not harm [but] will strengthen competition by creating a more efficient and effective competitor."[4] Alternately, a study by the Consumer Federation of America ("CFA") argues the merger "is anticompetitive from every angle" and that "[w]ireless competition will be dramatically reduced by the merger."[5] Financial analysts predict consolidation in the wireless industry will be "beneficial in terms of reduction of price competition and churn" and will "slow [ ] the relentless pace of price competition," but also may create the "potential for a return to scale in sales, advertising and distribution."[6] As with any merger, there are fears of market power and hopes of efficiencies, with the overall consumer benefit of the merger requiring an assessment of the merger's potential consequences.[7]

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1 J. Hall and S. Carew, *Cingular Wins AT&T Wireless for $41 Bln*, REUTERS (February 17, 2003).

2 *Turbulent Marketplace for Telecom Marked by Shifting Market Share; Comcast Holds Largest Provider Share of Customers Spending*, BUSINESS WIRE (April 21, 2004). The 2003 market shares of the national wireless carriers (subscribers, revenues) are: Verizon Wireless (29%, 29%), Cingular (21%, 18%), AT&T Wireless (20%, 20%), Sprint (15%, 16%), T-Mobile (10%, 9%), and Nextel (6%, 9%).

3 *Id*. The combined subscriber shares of the Bell Company owned wireless firms would be 70% and the combined revenue shares of the firms would be 67%.

4 Affidavit of Richard J. Gilbert filed on Behalf of Cingular and AT&T Wireless, WT Docket No. 04-70 (March 18, 2004), at 2, 3: http://www.fcc.gov/transaction/cingular-att_wireless.html.

5 M. Cooper, *Remonopolizing Local Telephone Markets: Is Wireless Next*? Consumer Federation of America (July 2004): http://www.consumerfed.org/localwireless.pdf.

6 R. Katz, *Can Mergers Mend Industry Woes*? AMERICA'S NETWORK (October 1, 2003) and Cellular *Stocks: This Year, Tread With Care*, BUSINESSWEEK EUROPE (January 1, 2004).

7 O. E. Williamson, Economies as an Antitrust Defense: The Welfare Tradeoffs, 58 AMERICAN ECONOMIC REVIEW 18-34 (1968).

To date, only one study of which we are aware presents a formal quantitative analysis of the total effects of the merger. This study, published by the non-profit Phoenix Center for Advanced Legal and Economic Public Policy Studies, reports the results from a financial event study and a merger simulation.[8] An event study assesses the effects of a merger by evaluating the stock price movements on or around announcements related to the merger.[9] Large positive stock price movements for non-merging firms in response to merger announcements indicates that investors believe the merger will increase the profits of rival firms, which is interpreted to mean an investor expectation of reduced competition in the industry. Lower stock prices are interpreted to mean the merger will increase the efficiency of the merging firms and, consequently, disadvantage rivals. Thus, the event study considers both the market power and efficiency consequences of the merger. Over the event dates of the Cingular/AT&T merger, the Phoenix Center estimates a 12.6% cumulate stock price *increase* for the non-merging firms. Using the financial data of the non-merging firms and the methodology proposed by Warren-Boulton and Dalkir (2001), this stock price increase is translated into a retail price increase of 7.9%.[10] Investors, it appears, believe the merger will reduce competition in the wireless industry by much more than it will improve the efficiency of the merging firms.

The Phoenix Center study also predicts the price increases from the merger using a simulation model. A merger simulation employs theoretical economic models of competition and real world data to simulate the effects of a merger between two rival firms.[11] The parameters of the theoretical model are calibrated with real world

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[8] Phoenix Center, *Higher Prices Expected from the Cingular/AT&T Wireless Merger*, PHOENIX CENTER POLICY BULLETIN NO. 11 (May 26, 2004).

[9] See, e.g., F. R. Warren-Boulton and S. Dalkir, Staples and Office Depot: An Event-Probability Case Study, 19 REVIEW OF INDUSTRIAL ORGANIZATION 467 (2001); D. Hosken and John David Simpson, Have Supermarket Mergers Raised Prices? An Event Study Analysis, 8 INTERNATIONAL JOURNAL OF THE ECONOMICS OF BUSINESS 329 (2001); G. Bittlingmayer and T. Hazlett, DOS Kapital: Has Antitrust Action Against Microsoft Created Value in the Computer Industry?, 55 JOURNAL OF FINANCIAL ECONOMICS, 329-359 (2000); G. L. Mullin, J. C. Mullin, W.P. Mullin, The Competitive Effects of Mergers: Stock Market Evidence from the U.S. Steel Dissolution Suit, 26 RAND JOURNAL OF ECONOMICS 314-330 (1995); R. A. Prager, The Effects of Horizontal Mergers on Competition: The Case of the Northern Securities Company, 23 RAND JOURNAL OF ECONOMICS 123-133 (1992); J. M. Woolley, The Competitive Effects of Horizontal Mergers in the Hospital Industry, 8 JOURNAL OF HEALTH ECONOMICS 271-292 (1989); R. Stillman, Examining Antitrust Policy Towards Horizontal Mergers," 11 JOURNAL OF FINANCIAL ECONOMETRICS 225-240 (1983); B. E. Eckbo, Horizontal Mergers, Collusion, and Stockholder Wealth, 11 JOURNAL OF FINANCIAL ECONOMETRICS 241-273 (1983).

[10] Warren-Boulton and Dalkir, *Id*.

[11] See, e.g., J. A. Hausman and G. K. Leonard, Economic Analysis of Differentiated Products Mergers Using Real World Data, 5 GEO. MASON L. REV. 321 (1997); Gregory J. Werden, Simulating Unilateral Competitive Effects from Differentiated Products Mergers, ANTITRUST (Spring 1997), at 27; P. Crooke, L. M. Froeb, S. Tschantz & G. J. Werden, The Effects of Assumed Demand Form on Simulated Postmerger Equilibria, 15 REV. INDUS. ORG. 205 (1999); G. J. Werden and L. M. Froeb, Simulation as an

data such as observed prices, quantities or market shares, and econometric estimates of demand elasticities. The Phoenix Center's merger simulation was based on the Cournot model of oligopolistic competition.[12] Using industry data and the static equilibrium properties of the Cournot model, the Phoenix Center evaluated its Cournot-competition assumption and found it to be a reasonable proxy for competitive interaction in the industry.[13] The Phoenix Center simulation was calibrated using existing market shares and an estimate of industry price and the market elasticity of demand. Assuming no cost efficiencies resulting from the merger, industry price was predicted to rise by 7.1%, reducing consumer welfare by $5.2B annually. Even with a 15% marginal cost reduction, the merger results in a 5.7% price increase and a consumer surplus loss of $4.2B. According to the Phoenix Center study, the merger of Cingular and AT&T Wireless is problematic from an antitrust perspective since the merger is predicted to result is sizeable price increases for wireless services.[14]

In this paper, we add to the formal analysis of the Cingular/AT&T Wireless merger by conducting a merger simulation. While our simulation predicts the effects on wireless prices from the merger, it is extended to assess what effects, if any, the merger could have on prices in wireline telecommunications. This extended effect of the merger is a consequence of the joint ownership of mobile and wireline carriers by dominant firms (i.e., the Bell Operating Companies) and the positive cross-price elasticities between the two telecommunications services (i.e., the two services are substitutes).[15] In other words, if wireless and wireline services are substitutes, then a profit-maximizing firm that sells both services will account for that substitution when it sets price, with the resulting prices being higher than if the two services were sold independently. Perhaps BellSouth CEO and Chairman

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Alternative to Structural Merger Policy in Differentiated Products Industries, in THE ECONOMICS OF THE ANTITRUST PROCESS 65 (Malcolm B. Coate & Andrew N. Kleit eds., 1996).

12 Cournot competition is described as competition in quantities, whereas Bertrand competition is competition in prices. In both cases, each firm behaves as if its rivals will not respond to the choices of the firm. See S. Martin, INDUSTRIAL ECONOMICS: ECONOMIC ANALYSIS AND PUBLIC POLICY (1988), at 104-17.

13 Phoenix Center, supra nt. 8, at 11 ("This suggests an α value of about 0.05, which is very close to the Cournot outcome of zero (the industry is slightly less competitive than Cournot)").

14 A 5% price increase is often viewed as being large enough to warrant attention, but the "small but significant non-transitory price increase" language from the GUIDELINES relates primarily to market definition. MERGER GUIDELINES §1.0: http://www.usdoj.gov/atr/public/guidelines/horiz_book/toc.html. Scheffman and Coleman, for example, note that in one case "a 2-3% price difference was meaningful to customers." D. T. Scheffman and M. Coleman, *Quantitative Analyses of Potential Competitive Effects from a Merger* (June 9, 2003), Presented at FTC/DOJ Joint Workshop on Merger Enforcement, February 17-19, 2004: http://www.ftc.gov/bc/mergerenforce/presentations/040218scheffman02.pdf.

15 POLICY BULLETIN NO. 11 at 12-13; J. Tirole, THE THEORY OF INDUSTRIAL ORGANIZATION (1995) at Ch. 5.

Duane Ackerman summarized it best: "Wireless substitution is now a fact. That's okay. We tend to own both."[16] As Mr. Ackerman so clearly explains, by owning both the substitution between the two services can be internalized. Our simulation can illustrate the effects of "owning both" on final goods prices.

The results of the simulation analysis are as follows. First, the prices of the merging firms are predicted to increase by no less than 11%. Given the chosen functional form of the demand curves used in the simulation, the prices of the merging parties' rivals do not change so the predicted industry effects are very conservative. Even so, the industry average price rises substantially. Consumer welfare reductions in mobile telecommunications from the merger total $2.7 billion. Even with the predicted reductions in cost from the merger, the merging firms' prices rise by no less than 10%. Second, the merger is predicted to increase the prices of wireline service by 2.4%, despite using extremely conservative assumptions regarding the degree of substitution between wireless and wireline services. On the wireline side, our simulation predicts consumer welfare losses of over $300 million annually.

In the next section we describe in detail our merger simulations. First, we present the econometric model used to estimate the demand elasticities. These elasticities play a key role in the merger simulation. Second, we present the results of the merger simulation on wireless prices assuming no change in the marginal cost of the merging firms. Third, we compute the price effects of the merger assuming the merger results in efficiencies. Fourth, we present the price effects for both wireless and wireline services in our extended simulation. Fifth, we evaluate, in some cases with simulation, some potential negative effects on other markets that this merger could produce. Sixth, consumer surplus losses from the merger are summarized. Conclusions are provided in the final section.

II. The Merger Simulation

The predicted price responses from merger simulations depend heavily on a number of key assumptions, including the form of competition, the shape of demand and cost curves, and the firm-specific demand elasticities (own- and cross-price) and marginal costs. Any predicted price effects from a merger are conditional on the very specific set of assumptions used for the simulation. Our particular set of assumptions is as follows. First, we adopt a product differentiated price-competition model (i.e., Bertrand). Thus, our focus is solely on unilateral price effects; there is no effort to measure the effects on the intensity of price competition or the potential for collusion, which have been historically the primary concern of antitrust analysis. Second, the demand curves are semi-log, a decision based on the econometric analysis used to estimate the own- and cross-price

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[16] *More Callers Cut off Second Phone Lines for Cellphones, Cable Modems*, WALL STREET JOURNAL B1 (November 15 2001) (quoting Duane Ackerman).

elasticities of demand. Third, the own- and cross-price elasticities of demand are based on our own econometric analysis. Fourth, marginal costs are assumed to be constant and are derived from the relevant markup rules based on first-order conditions for profit maximization, using the demand elasticities from our econometric analysis. Other relevant assumptions and inputs are presented in those sections in which they are used.

1. ESTIMATES OF DEMAND ELASTICITIES

The typical econometric demand curve for the Bertrand competitor *i* with *r* rivals is

$$q_i = \beta p_i + \gamma \sum_{j=1}^{r} p_j + \Omega X + \varepsilon_i \qquad (1)$$

where p_i is the firm *i*'s own-price and p_{-i} is the price of the rival(s) to firm *i*, **X** is a vector of factors other than own and rival prices that affect demand and ε is the econometric disturbance term. The parameters β, γ, and Ω are all estimated by an appropriate econometric model. From these estimated parameters we can compute the required own- and cross-price elasticities necessary to perform the Bertrand simulation.

More specifically, our econometric analysis begins with the general model specification

$$g\left(\frac{q_i}{Q}\right) = f\left(\alpha_0 + \alpha_1 p_i + \alpha_2 \sum_{j=1}^{r} \frac{s_i}{s_j} p_j + \alpha_3 POPS + \alpha_4 DTM\right) + \varepsilon_i \qquad (2)$$

where *Q* is total industry quantity (so *q*/*Q* is market share), s_i is a quality index for firm *i* (and *j*), *POPS* is a measure of the total population served by the firm *i*'s network, and *DTM* is dummy variable for the wireless firm T-Mobile.[17] The functions *f* and *g* are suitably selected transformations of the variables. Market share rather than quantity is employed because of the rapid growth of wireless

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[17] The individual firm's Form 10-Ks and 10-Qs provide all the quantity and price data. Prices are computed as the annual service revenues divided by end-of-year subscriber lines. This approach to computing price is somewhat problematic for T-Mobile given that its subscriber base is growing rapidly. As an alternate specification, we replaced T-Mobile's price with its reported average revenue per unit (ARPU). The computed elasticities were not much affected (the own-price coefficient increased by about 5% and the cross-price coefficient increased by 2%. Thus, we employ a consistent method for computing price for all firms by using service revenues deflated by lines. Quality data is provided by *J.D. Power and Associates Reports: Verizon Wireless Ranks Highest in Network Quality Performance* (July 29, 2003). POPS data is provided by J. Rockhold, *2002 Who Gets Out Alive*? WIRELESS REVIEW (December 1, 2002): http://www.findarticles.com/p/articles/mi_m0GTV/is_23_18/ai_80848046/print. The data is provided in Exhibit 2.

subscription over the sample period.[18] The cross-price effects are weighted by a quality index, thus making the size of the cross-price depend on the relative quality between firm *i* and each of its rivals.[19] Coefficients α_1 and α_2, respectively, are used to compute the own-price and cross-price elasticities of demand. The exact computation for the elasticity will depend on the specific functional form of functions *f* and *g*.[20]

Rather than impose *a priori* a particular functional form on the regression, we select the functional form with the "best" statistical properties. Candidate transformations considered here include the widely used linear and logarithmic transformations (e.g., lin-lin, log-lin, and log-log). Research shows that the functional form of the demand curve for the simulation is an important determinant of the size of the simulated price effects. We believe that allowing the data to inform us to the most suitable functional form is an improvement over simply assuming a functional form that may have desirable properties for simulation (e.g., such as the frequently used logit demand functional form which allows simulations to be performed with very little information). Five statistical criteria are employed in selecting the best functional form. First, we compare the fit of the models using a measure of R-squared that is comparable across alternate specifications of the dependent variable.[21] Second, following Godfrey et al (1988), we employ RESET.[22] RESET is a general test of specification error and is a powerful test for incorrect functional form.[23] Third, we test the model for heteroskedasticity using White's Test.[24] Fourth, we use Jarque-Bera test to evaluate the normality of the disturbance

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18 The wireless market has grown from 81.7 million accounts in 2000 to 122.4 million in 2003, a growth rate of almost 50%. This rate of growth is very rapid. By using market shares rather than quantities, we render the dependent variable vector stationary and avoid the significant problems of accounting for growth parametrically.

19 *J.D. Power and Associates Reports: Verizon Wireless Ranks Highest in Network Quality Performance* (July 29, 2003): http://www.jdpower.com/cc/telecom/jdpa_ratings/wireless/Find.jsp. The scale of the quality index is irrelevant because the ratio is used. For this particular scale, the index has a value of 100 for AT&T. The regression results are not much affected by the inclusion of the quality adjustments, but these adjustments did allow the cross-price effects to vary by price and quality.

20 The own-price demand elasticities for various functional forms are: a) the Lin-Lin model = $\alpha_2(p_i/q_i)$; b) the Log-Lin model = $\alpha_2 p_i$; and c) the Log-Log model α_2.

21 A. H. Studenmund, USING ECONOMETRICS (1992) at 227-9.

22 L. G. Godfrey, M. McAleer and C. R. McKenzie, *Variable Addition and Lagrange Multiplier Tests for Linear and Logarithmic Regression Models*, 70 REVIEW OF ECONOMICS AND STATISTICS 492-503 (1988).

23 D. Gujarati, BASIC ECONOMETRICS (1995) at 464-6.

24 *Id* at 379-380.

term.[25] Finally, we appeal to the Davidson-McKinnon J-Test to evaluate which, if any, of the specific functional forms is most desirable.[26]

Table 1 summarizes the results of the model selection tests. Overall, the tests indicate that the Log-Lin (or semi-log) specification is best. The R-squared values are all high and too similar to indicate a preference for a particular model. Only the Log-Lin functional form passes the RESET test (with a null hypothesis of "no specification error") at the 10% significance level, so a clear preference for the Log-Lin specification is indicated by RESET. Both the Lin-Lin and Log-Lin models have homoskedastic disturbances, but the Log-Log form is heteroskedastic.[27] All three functional forms render normally distributed disturbances, so all are suitable on normality grounds. The Davidson-MacKinnon J-Test also shows a clear preference for the Log-Lin functional form, since neither of the t-statistics for the augmented regressions is statistically significant for the Log-Lin form. The Log-Lin form is shown to be preferable to either the Lin-Lin (probability 0.0185) or Log-Log (probability 0.1033) models. Based on this battery of tests, we believe the Log-Lin or semi-log specification is best and, consequently, we use the results from the semi-log models to compute own- and cross-price elasticities. We also base all calculations in the merger simulation on the semi-log demand curve.

Table 1. Functional Form Selection Criteria

Model	*Quasi R^2*	*RESET*	*White*	*J-Bera Test*
Lin-Lin	0.880	0.105	0.508	0.922
Log-Lin	**0.888**	**0.235**	**0.140**	**0.825**
Log-Log	0.892	0.050	0.050	0.825

Davidson-McKinnon J-Test (t-stat probability)

Base Model ↓	Lin-Lin	Log-Lin	Log-Log
Lin-Lin	…	0.0185	0.0152
Log-Lin	**0.2596**	**…**	**0.3009**
Log-Log	0.9848	0.1033	…

The estimated parameters from the semi-log specification are summarized in Exhibit 1. The model exhibits good statistical significance and overall fit. As already mentioned, the disturbance is normal and homoskedastic and the model passes RESET. Given the small sample size (24 observations), we also evaluated statistical significance using a bootstrap procedure.[28] Given the large t-statistics on the price coefficients (both exceeding 4.00 in absolute value), we did not expect the

[25] *Id* at 143-4.

[26] Id at 490-3.

[27] Heteroskedasticity only affects the efficiency of the estimates and not result in biased coefficients. Thus, the point estimates of the elasticities will be unaffected by heteroskedasticity.

[28] J. MacKinnon, *Bootstrap Inference in Econometrics*, 35 CANADIAN JOURNAL OF ECONOMICS 615-645 (2002).

non-parametric approach to render different conclusions on statistical significance and we were correct. The bootstrapped critical values were about 2.2, so both price coefficients are statistically different from zero regardless of how significance is evaluated. We also bootstrapped the RESET F-statistic, and our conclusions were unchanged.

Table 2. Elasticities, Prices, and Implied Marginal Costs

	Own-Price Demand Elasticity (η_i)	Pre-Merger Price	Marginal Cost	Price-Cost Margin
Verizon	-1.92	45.19	21.65	0.52
Cingular	-2.09	49.33	25.73	0.48
AT&T Wireless	-2.52	59.37	35.81	0.40
Sprint	-2.57	60.52	36.97	0.40
T-Mobile	-1.82	42.97	19.36	0.55
Nextel	-2.71	63.99	40.37	0.37

The own-price and cross-price elasticities are derived from the results of the econometric model summarized in Table 2, with the own-price elasticities of demand being -0.042p_i and the cross-price elasticities being 0.01p_j where p_j is the quality-adjusted price for firm j (each firm has five cross-price elasticities, one for each of its five rivals). The firm-specific elasticities are a function of own-price alone, but the overall demand curve is related (in a statistically significant way) to the prices of rivals (the services are substitutes, as expected).

The estimated elasticities are used to derive marginal costs, based on the first-order condition:

$$1 + \eta_i \left(\frac{p_i - c_i}{p_i} \right) = 0 . \tag{3}$$

Armed with the prices, market shares, demand elasticities, and marginal costs, the merger simulation can be conducted. The semi-log demand specification is passed through to the merger simulation, so the relevant first-order conditions reflect this demand model. The additional specifics of the merger simulations are described in the following sections.

2. SIMULATION OF WIRELESS PRICES, NO EFFICIENCIES

In our first simulation, AT&T Wireless and Cingular merge, but maintain unique customers bases and separate prices.[29] Incremental costs are assumed to be

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[29] It is more profitable for the firm to have two prices rather than one as long as there are variations in demand across customers. Also, there is some evidence that the merged firm intends to operate in the short term using both brands. See E. Morphy, Cingular, *AT&T and AT&T Wireless Resolve Brand Issues*, NEWSFACTOR NETWORK (August 25, 2004) (“"We have worked out an arrangement with AT&T Wireless (NYSE: AWE - news) and Cingular that is designed for us to fully meet our plans

unchanged following the merger. Because of the semi-log demand specification – where elasticities are a function of prices only, not quantities – the optimal prices of Verizon, Sprint, T-Mobile, and Nextel do not change following the merger. This feature of the simulation makes the industry-wide price increases from the merger very conservative since only the merging firms' prices change (the price change is purely unilateral).

In the simulation, following the merger AT&T Wireless and Cingular take into account the cross-price elasticities of demand between them, so post-merger prices for AT&T Wireless and Cingular solve

$$\max \pi^{M} = \pi^{A} + \pi^{C} \tag{4}$$

where π^M represents profit from wireless/mobile services, π^A is profit from AT&T Wireless and π^C is profit from Cingular wireless. The simulation focuses on the joint profit maximization by Cingular and AT&T Wireless, so the computed price increases from this simulation are from the unilateral exercise of market power.

The equation(s) to solve for post-merger prices are

$$D_i(\cdot)\big(1-(p_i-c_i)(-0.0424)\big)+D_j(\cdot)(p_j-c_j)(0.0098)(s_i/s_j)=0 \tag{5}$$

where $D_i(\cdot)=k_i\exp(Z_i)$ is demand for firm i and k_i is the calibration factor that makes D_i exactly equal the observed pre-merger market share and Z_i is the value of the regression equation with inputs for firm i (summarized in Exhibit 1).[30] These equations are solved simultaneously for the merging firms (using Maple mathematics software).

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for serving customers with AT&T-branded wireless services …"). Obviously, if we computed a single price for the merged firm it would lie between the individual firm prices. There is discussion of eliminating overlap in the calling plans of the two carriers, but integrating the other plans. *See* K. Belson and M. Richtel, *For Cingular, Becoming No. 1 Also Poses Risks*, NEW YORK TIMES (Sept. 27, 2004).

[30] To do the simulation, the market shares of AT&T Wireless and Cingular are calibrated by being multiplied by a constant so that, at initial prices, the "predicted" market shares of AT&T and Cingular are exactly equal to 0.175 and 0.192, respectively. This calibration does not affect the elasticities (they are as reported in Table 2). While we do not impose an adding up restriction on market shares, the simulated market shares are very close to 1.00 (ranging from 1.02 to 0.99). So, the model is well behaved in this sense. Linear models, alternately, are generally not so well behaved.

Table 3. Simulated Price Increases

	Pre-Merger Price	Post-Merger Price	% Price Increase
Cingular	$49.33	$54.90	11.3%
AT&T Wireless	$59.37	$68.50	15.4%
Industry Avg.	$52.11	$54.18	4.0%

The pre- and post-merger prices are summarized in Table 3. The simulated price increases are large, with Cingular's price rising 11.3% and AT&T Wireless' price rising by 15.4% as a consequence of the merger. Using calibrated predicted market shares and the post-merger price vector, a price index for wireless service rises from $52.11 to $54.96 (4%) due to the merger induced market share and price changes.[31] Recall that the increase in the wireless industry price index is based solely on the price increases by the merging firms – the prices of the rival firms are unchanged (due to the demand model). Thus, the predicted increase is very conservative.[32]

3. SIMULATION OF WIRELESS PRICES, WITH PREDICTED MERGER EFFICIENCIES

In the previous simulation, we assumed that marginal costs were unchanged by the merger. By allowing marginal cost to decline for the post-merger firms, the expected price increase from the merger accounting for merger efficiencies can be computed. Based on the testimony filed on behalf of the Cingular and AT&T Wireless, we assume a 1.4% reduction in marginal cost and re-compute the post merger prices.[33] The results are summarized in Table 4.

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31 Industry wide price was calculated by taking the antilog of the fitted values the regression which are calibrated to sum to one. We then compute a market share weighted average price.

32 As a rough indicator of how conservative the estimate is, we also simulated the merger using our inputs with a PCAIDS demand model. Other assumptions include a 50% margin for Verizon Wireless, a market demand elasticity of –0.50, and 2003 revenues shares for the firms. The simulated industry price increase was 7.8%.

33 Gilbert, supra nt. 4, at ¶29 ("Cingular estimates that the efficiencies … will generate operating and capital expense savings of more than $1B in 2006 and more than $2 billion per year in the following years as a merged entity"). Thus, the merger is expected to reduce total costs by about $1B over the next two years (2005, 2006). MERGER GUIDELINES, supra nt. 14 at §3.2. In 2003, the operating cost and capital expenses of Cingular and AT&T Wireless summed to about $35 billion, suggesting a reduction in overall costs of about 1.4% ($1B/$70B). Of course, only reductions in marginal costs are relevant to equilibrium prices and we assume here that all components of total costs are affected by the same amount (1.4%). Also see Affidavit of Steven McGaw filed on Behalf of Cingular and AT&T Wireless, WT Docket No. 04-70 (March 18, 2004), at ¶¶23-27: http://www.fcc.gov/transaction/cingular-att_wireless.html. According to Ralph de la Vega, Chief Operating Officer of Cingular, the integration of the two carriers will probably take two years, suggesting that merger-related savings will not occur in the short term. *See* K. Belson and M. Richtel, supra nt. 29.

Table 4. Simulated Unilateral Price Increases (1.4% Marginal Cost Reduction)

	Pre-Merger Price	Post-Merger Price	% Price Increase
Cingular	$49.33	$54.60	10.7%
AT&T Wireless	$59.37	$67.80	14.2%
Industry Avg.	$52.11	$54.09	3.8%

Assuming a 1.4% marginal cost reduction resulting from the merger, the post-merger prices of Cingular and AT&T Wireless still rise by more than 10%. Cingular's price rises by 10.7% and AT&T Wireless' price rises by 14.2%.[34] The wireless industry price index rises by 3.8%. Recall that the industry price increase assumes that only the prices of the merging firms change, so the predicted increase is very conservative.

4. SIMULATION OF WIRELINE PRICES

As mentioned, the acquisition of AT&T Wireless by Cingular places about 70% of wireless customers in the hands of the dominant wireline telecommunications carriers. Since SBC, BellSouth (Cingular's parent companies) and other ILECs contend that wireless and wireline telecommunications services are substitutes, the merger may have effects on prices in the wireline sector as well.[35] In this section, we describe our methodology to assess the effect of the merger on wireline prices. This analysis should be regarded as somewhat crude, as no data is available for several key inputs to the simulation such as firm-specific cross-price elasticities between wireline and wireless services.

The measurement of wireline price effects is based on the following general conceptual points: 1) wireless and wireline services are assumed to be substitutes; 2) Verizon Wireless is owned by the Bell Operating Company Verizon; 3) Cingular is jointly owned by Bell Operating Companies BellSouth and SBC; 4) the own/cross price elasticity estimates for our companies are independent of wireline price (which varies relatively little among Bell Companies); and 5) the extended

[34] Even with a large reduction in marginal cost of 5%, Cingular's price rises by 7.4% and AT&T Wireless' price rises by 12.8%.

[35] See, e.g., *Comments of SBC Communications*, CC Docket No. 01-338 at 38 (April 5, 2002) ("wireless networks built to serve high end customers initially are now being used to offer a portable substitute for wireline service.") See also, *Comments of BellSouth Communications*, CC Docket No. 01-338 at 22 (April 5, 2002) (FCC must consider intermodal competition "particularly with regard to wireless substitution" in assessing whether competitors are impaired without access to UNEs). Many of the Bell Company filings in CC Docket No. 01-338 claim that wireless and wireline are effective intermodal competitors. See, *e.g.*, Shelanski Declaration accompanying the comments of SBC and BellSouth in the above-referenced proceeding at ¶ 59 ("Switching Appears Yet More Competitive in Light of Wireless Competition.")

simulation should be logically and mathematically consistent with the previous wireless-only simulation.

For the simulation, we assume the following: 1) Bell Companies already price wireless/wireline services to internalize price effects where relevant; 2) the relevant wireline "price" is not the basic dialtone service price (or POTS, plain old telephone service), but is measured as the revenues on services beyond basic dialtone service less the incremental cost of these additional services. It is these additional services that are unregulated and thus allow for relatively unconstrained price increases. Thus, our wireline "price" is average customer expenditures on wireline services minus the average price for basic residential service.[36] We also express price in terms of a margin and assume the incremental cost of the additional services (long-distance costs and enhanced services) is $4.[37] Prices are summarized in Table 5.[38] For the simulation, we use as price for BellSouth and SBC the line weighted average price (BS 29%, SBC 71%) for wireline service ($13.87).

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[36] Our treatment of wireline price for the simulation is based on the "representative agent" or "average consumer" format. Basic dialtone is not a marginal service for the average consumer. In addition, one must buy dialtone to get all the other services, even long distance, which runs average revenue up to almost twice the basic monthly service rate. Furthermore, estimated elasticities for basic dialtone are estimated to be very small (typically reported to be less than 0.05), and this cannot be used in any profit maximization calculus of first-order conditions. Our approach is also reasonable in that any finding of a price increase for wireline will result in no implied disconnections from the local switched networks.

[37] Average long-distance usage is about 90 minutes and the average transport/access price is assumed to be about $0.02 per minute. See *Trends in Telephone Service*, Federal Communications Commission (May 2004), at Table 14.1. In states where forward looking cost estimates for enhanced features are estimated, the prices are typically about $1-$3 for all features or $0.10 to $0.30 for individual features. For a bundle of all features (excluding voicemail), the cost estimates in the BellSouth region are as follows: Alabama ($1.98), Florida ($2.17), Georgia ($0.78), Mississippi ($2.56), North Carolina ($2.40), South Carolina ($3.04). Individual features such as Caller ID and Call Waiting have costs of $0.22 and $0.03 in Alabama. In California, most features have costs of about $0.17 each. Of course, feature penetration is not 100%, so only some portion of the costs will apply to the average consumer. Most likely, $4 is a high estimate of the incremental cost of these services (if cost is $0.20 and penetration is 30%, then the average cost is $0.06). As the margin on additional services increases (declines), the price effect in wireline will be large (smaller).

[38] Average revenue data is provided by Comptel/Ascent, *Consumers Spent $11 Billion Less in 2003 Than Before Competition*, Comptel/Ascent News Release (March 15, 2004): http://www.comptelascent.org/news/recent-news/031504.html. Average basic dialtone rates are from B. J. Gregg, *A Survey of Unbundled Element Prices in the United States* (July 2003): http://www.nrri.ohio-state.edu.

Table 5. Wireline Simulation Inputs

	Avg. Revenue per Line	Basic Residential Price	Net Price	Wireless/Wireline Revenues
BellSouth	$39.24	$24.20	$14.94	0.31
SBC	$34.28	$20.85	$13.43	0.27
Verizon	$38.04	$25.28	$12.78	0.57

The simulation is based on the assumption that Cingular, which is jointly owned by BellSouth and SBC, operates to maximize joint profits of the owners and thus would solve

$$\max \ \pi = \pi^M + \pi^W \tag{6}$$

over relevant wireless and wireline prices where π^M is mobile profits and π^W is wireline profits. After the merger, BellSouth and SBC now own both AT&T Wireless and Cingular, so they internalize this in their pricing. We assume the cross-price elasticities between wireline (*W*) and wireless (*M*) services are $\eta_{WM} = 0$, $\eta_{MW} = 0.10$, where η_{WM} (η_{MW}) is the cross-price elasticity between the quantity of wireline (wireless) services with respect to the wireless (wireline) price. These assumptions imply that the mobile price of a firm does not affect the firm's wireline demand, but the firm's wireline price affects the firm's wireless demand as substitutes (though the effect is assumed to be small).[39] Also, if $\eta_{WM} > 0$, the simulation would produce even higher prices for wireless and wireline services. Given the specification of cross-price elasticities, extending the simulation to include the wireline market has no additional effect on wireless prices ($\eta_{WM} = 0$). However, the merger will cause an increase in wireline prices. We note that this set of assumptions allows us to use our previously calculated marginal costs for wireless services.

Prior to performing the simulation, we use the first-order conditions for Verizon and Cingular to infer the implied firm elasticities of demand for wireline services other than basic dialtone. For Verizon and BellSouth/SBC, we solve

$$\left(\frac{R_W}{R_M}\right)\left[1+\left(\frac{P_W - C_W}{P_W}\right)\eta_W\right]+\left(\frac{P_M - C_M}{P_M}\right)\eta_{MW} = 0 \tag{7}$$

[39] The rationale is that monopoly power is nearly complete in wireline services, but limited by some competition in wireless. Thus, if a firm raises its wireless price, it loses sales to other wireless competitors, not the local wire network. On the other hand, if Verizon, say, or BellSouth or SBC raises wireline prices, they are in effect raising the whole market price of wireline and the only alternative is wireless service. These assumed elasticities also imply that wireline service would not be in the antitrust market for wireless services.

where *R* is revenues from wireline (*W*) and wireless (*M*) services, and the inputs for the equation are summarized above. The solution for Verizon is η_W = -1.51 and for BellSouth/SBC is η_W = -1.43, reasonable figures under the circumstances.

With these inputs, we can now simulate the effect of the AT&T Wireless and Cingular merger on wireline prices. For the simulation, we assume that there are no incremental cost savings and the ratio of wireline to wireless revenues is unchanged (or changes very little). Wireline prices are affected only in the BellSouth and SBC service regions. We also note that: 1) wireline prices are unchanged for Verizon; 2) mobile prices rise only for AT&T and Cingular as before; 3) the only "new" price is for BellSouth/SBC wireline services. Using the elasticity η_W = -1.43, the simulation predicts a wireline price increase of 2.4%, rising from $13.87 to $14.20 per customer-month.

This 2.4% price increase is a very conservative estimate of the effect of an enlargement of mobile operations owned by Bellsouth and SBC since it results solely from the very small cross-price elasticity in which wireline price increases raise mobile demands (η_{MW} = 0.10). As either η_{MW} or η_{WM} rises, the price effects of the merger rise. For wireless to be effective intermodal competition, η_{MW} would presumably have to be much larger than 0.10.[40]

5. OTHER EFFECTS OF THE MERGER

Our simulation encompasses the plausible consequences of a small, positive cross elasticity of demand on the pricing of wireline services by SBC and BellSouth. However, these firms sell a number of additional, significant products to both consumers and rivals (such as CLECs and rival wireless carriers) that may also be affected by the change in incentives created by the merger. Although we are unable to directly evaluate these effects, it is apparent that they might be important in any evaluation of the social consequences of this merger. From a theoretical point-of-view, the presence of a positive cross-price elasticity (regardless of size) will result in price increases for the conventional reasons, and the merger exacerbates these effects because the prices of all substitute services will be strategic complements for the firms. For example, the Bell Companies sell network elements to rivals, who use these functions to sell communications services in competition with the Bell. By increasing the prices of these elements, the Bell Companies may increase the residual demand for their own services.

Likewise, Bell Companies sell special access services (and/or UNE-Transport) to their wireless rivals. The cost to the Bell Company of selling such services to rivals includes the opportunity cost arising from the use of such services by the rival to

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[40] For an analysis of intermodal competition between wireless and wireline services, see Phoenix Center, *Fixed-Mobile "Intermodal" Competition in Telecommunications: Fact or Fiction*?, PHOENIX CENTER POLICY BULLETIN No. 10 (March 30, 2004): http://www.phoenix-center.org/.

serve customers that would otherwise be the customer of the Bell's affiliated wireless carrier.[41] This opportunity cost rises with the profitability of wireless service and the market share of the Bell-affiliated wireless carrier. Therefore, the higher market share and profitability of wireless service resulting from the merger encourages the Bell Companies to increase prices for special access/transport services (or any other input sold by the Bell Company to its wireless rivals). The same logic applies with equal force to roaming agreements between wireless carriers, since roaming agreements improve the quality of a rival's service. The merger may lead to higher prices in roaming agreements, if not to the elimination of such agreements altogether.

The increase in profitability for Bell-affiliated wireless carriers caused by raising rivals' costs by increasing transport and roaming prices can be crudely illustrated using our merger simulation. For example, assume that by increasing the prices for transport facilities and/or roaming, the marginal costs of the smaller wireless carriers (T-Mobile, Nextel, and Sprint) are increased by 5%. This increase in marginal cost causes post-merger prices of these carriers to increase by the amounts provided in Table 6. Note that the industry price increase is now 4.6% (versus 4% from the default scenario) since the merger-induced price increases are not restricted to the merging firms.[42] Because the higher prices charged by the smaller carriers result in larger market shares for Cingular and AT&T Wireless, the profits of the two merging firms rise as a result of raising rivals costs. An index of profitability for the two merging firms rises by 17.5% (above the profit effects of the merger alone) as a consequence of the raising rivals' cost strategy.[43]

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[41] The economics of selling inputs to rivals is presented in T. R. Beard, G. S. Ford, and L. W. Spiwak, PHOENIX CENTER POLICY PAPER NO. 12, *Why ADCo? Why Now? An Economic Exploration into the Future of Industry Structure for the "Last Mile" in Local Telecommunications Markets*, 54 FEDERAL COMMUNICATIONS LAW JOURNAL 421-460 (2002) (http://www.law.indiana.edu/fclj/pubs/v54/no3/spiwak.pdf).

[42] If we let only the marginal cost of Nextel and T-Mobile rise, then the industry average price increases by 4.4%.

[43] The index of profitability is computed by multiplying each firm's calibrated market share by the margin of price over cost. Shares are calibrated by ensuring that the sum of predicted market shares equals one. Further, since the industry price rises, we adjust the post-merger profit to account for the reduction in total industry quantity using an industry demand elasticity of –0.5. Without raising the cost of rivals, the profits of the merging firms rise by 14.8%.

Table 6. Simulated Price Increases with Raising Rivals Costs
(5% Increase in Marginal Cost)

	Pre-Merger Price	Post-Merger Price	% Price Increase
Cingular	\$49.33	\$54.60	10.7%
AT&T Wireless	\$59.37	\$68.50	15.4%
Sprint	\$60.52	\$62.40	3.1%
T-Mobile	\$42.97	\$43.91	2.2%
Nextel	\$63.99	\$65.97	3.1%
Industry Avg.	\$52.11	\$54.52	4.6%

We emphasize that the absence of a formal treatment of these effects in our analysis does not imply these effects are unimportant or absent. Indeed, these effects should be carefully considered in any evaluation of this proposed business combination.

6. CONSUMER WELFARE EFFECTS

The Antitrust laws are designed primarily to protect consumers. Our simulations suggest that the AT&T Wireless/Cingular merger harms consumers in two ways: 1) increased prices for wireless services and 2) increased prices for wireline services (in the SBC/BellSouth regions). Crude estimates of the consumer welfare effects of the merger can be computed as follows.

For wireline services, Bellsouth and SBC serve about 80.7 million wireline access lines. Using a constant elasticity calibrated demand so $q = k \cdot \exp(.)\, p_W^{-1.43}$, a change in price from \$13.87 to \$14.20 yields a welfare change of

$$\begin{aligned} \Delta CS &= 3.5 \cdot 10^{9} \cdot \int_{13.87}^{14.20} s^{-1.43}\, ds \\ &= \$26{,}425{,}000 / month \end{aligned} \tag{8}$$

or about \$317,000,000 per year in the BellSouth and SBC regions.[44]

For wireless services, the effects of the merger are obviously much larger. Assuming a wireless industry elasticity of –0.50 and a price increase from \$52.11 to \$54.18, the change in consumer welfare is about \$227M per month, or about \$2.7B annually.[45] Recall, however, that the industry price increase assumes that only the prices of merging firms increase, so the estimate of consumer welfare effects is very conservative. In our raising rivals' cost scenario, the 5% increase in rivals' marginal

[44] "Calibration" refers to a selection of values for k so that the quantity of services bought equal the observed quantity (80.7 million lines) at current prices.

[45] Consumer welfare changes are computed using pre- and post-merger industry prices, a total market size of 110.3 million lines, and an industry elasticity of –0.5. Calibration is used to ensure that the total quantity is 110.3 million lines at an industry price of \$52.11.

cost increases the consumer welfare loss by about 16% above the $2.7B from the benchmark case.

III. Conclusions

In this paper, we have presented a merger simulation of the Cingular/AT&T Wireless merger. The simulation was designed to predict price changes in both wireless and wireline markets, though the price effects for wireless are admittedly crude and limited to residential services only. In wireless, the unilateral price effects are large, exceeding 10% even after accounting for expected merger efficiencies. Consumer surplus in wireless markets is predicted to decline by $2.7 billion despite the very conservative nature of our simulations. In wireline markets, prices are predicted to rise by 2.4%, with about $300 million in annual consumer surplus losses. Our merger simulation is also used to show the possible price, profit, and consumer welfare impacts of a raising rivals' costs strategy effectuated in part by the wireline parents of the merging wireless firms. The profit and welfare effects are shown to be sizeable.

Our results are generally consistent with an earlier study of the merger that used an event study and merger simulation to predict the effects of the merger. That study predicted price increases in the 5% to 8% range, and our results are close to those figures. To date, the only formal quantitative analyses of the merger, including this one, predict rather large price increases even accounting for expected efficiencies.

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September 30, 2004

EXHIBIT 1.

Regression Results		
	Coefficients (Robust t-stat)	Mean [st. dev.]
Constant	-1.258	…
	(-1.54)	
p_i	-0.042	51.44
	(-5.98)	[8.95]
$\Sigma(s_i/s_j)p_{-i}$	0.010	257.11
	(4.84)	[19.77]
POPS	-0.004	228.5
	(-3.37)	[34.74]
DTM	-1.254	0.17
	(-6.26)	[0.38]
MS	…	0.17
		[0.08]
ln(MS)	…	-1.91
		[0.53]
R^2	0.87	
Obs.	24	

EXHIBIT 2.

Firm	Year	Service Revenues	Subscribers	POPS	J.D. Power Quality Index
Verizon	2003	20336	37.5	248	104.00
Cingular	2003	14223	24.0	211	101.00
AT&T Wireless	2003	15659	22.0	165	100.00
Sprint	2003	11548	15.9	244	95.00
T-Mobile	2003	6755	13.1	273	94.00
Nextel	2003	9892	12.9	230	103.00
Verizon	2002	17747	32.5	248	104.00
Cingular	2002	13922	21.9	211	101.00
AT&T Wireless	2002	14483	20.9	165	100.00
Sprint	2002	10867	14.8	244	95.00
T-Mobile	2002	4245	8.7	273	94.00
Nextel	2002	8186	10.6	230	103.00
Verizon	2001	16011	29.4	248	104.00
Cingular	2001	13229	21.6	211	101.00
AT&T Wireless	2001	12532	18.0	165	100.00
Sprint	2001	8577	13.6	244	95.00
T-Mobile	2001	2926	5.8	273	94.00
Nextel	2001	6575	8.7	230	103.00
Verizon	2000	13000	26.8	248	104.00
Cingular	2000	10424	19.7	211	101.00
AT&T Wireless	2000	9374	15.1	165	100.00
Sprint	2000	5453	9.5	244	95.00
T-Mobile	2000	1520	3.9	273	94.00
Nextel	2000	4995	6.7	230	103.00

The individual firm's Form 10-Ks and 10-Qs provide all the quantity and price data. Prices are computed as the annual service revenues divided by end-of-year subscriber lines. Quality data is provided by *J.D. Power and Associates Reports: Verizon Wireless Ranks Highest in Network Quality Performance* (July 29, 2003). POPS data is provided by J. Rockhold, *2002 Who Gets Out Alive*? WIRELESS REVIEW (December 1, 2002): http://www.findarticles.com/p/articles/mi_m0GTV/is_23_18/ai_80848046/print. The data is provided in Exhibit 2.