Braden Cox
Technology Counsel

May 11, 2005

EX PARTE – VIA ELECTRONIC FILING

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

Re: WC Docket No. 05-65; WC Docket No. 05-75

Dear Ms. Dortch:

On May 9, 2005, Wayne Crews and the undersigned of the Competitive Enterprise Institute ("CEI") met to discuss the above two matters with Marcus Maher, Gail Cohen, Craig Stroup, Jon Minoff, Rodger Woock, Bill Dever, Pam Megna, Paul Zimmerman, Takeo Iijima, and Ben Childers of the Competition Bureau, Chuck Needy of the Office of Strategic Planning, and Joel Rabinovitz, Kent Nilsson, and C. Anthony Bush of the Office of General Counsel.

The purpose of the meeting was to discuss CEI's reply comments in connection with the mergers of SBC with AT&T and Verizon with MCI. At the meeting the undersigned distributed the attached study by CEI that provides evidence that wireless companies compete with wireline companies for voice service. CEI representatives discussed that this paper finds convincing empirical evidence that wireless services are strong substitutes for wireline services. This fact has significant implications on competitive and regulatory policies with regard to the mergers under review. For example, if wireline service providers cannot raise prices without causing significant line loss to wireless providers, then it can be concluded that wireline service providers are unable to exert market power. Furthermore, as wireless prices continue to fall, wireline providers will be under increasing market pressure to follow suit, in order to stem market share losses. Thus, CEI representatives noted, the nature of competition has changed, and price and service regulation is largely unneeded because market forces are sufficient to hold prices in check.

If you have any questions regarding this notice, please contact me at 202.331.2254.

Sincerely,

Braden Cox

Braden Cox

Enclosure

1001 Connecticut Ave. NW, Ste 1250, Washington, DC 20036
Telephone: (202) 331-2254 Facsimile: (202) 331-0640 Email: bcox@cei.org

Competitive Enterprise Institute

Issue Analysis

Wireless Substitution and Competition

Different Technology but Similar Service—Redefining the Role of Telecommunications Regulation

by Stephen B. Pociask

December 15, 2004

Wireless Substitution and Competition

Different Technology but Similar Service – Redefining the Role of Telecommunications Regulation

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Executive Summary

In the absence of competition, regulations serve to protect consumers against monopoly market power. This is, in theory, the reason why the telecommunications local exchange market is so heavily regulated. While the days of the monopoly have long passed, when do policymakers know if there is enough competition to let markets operate without regulation? The Federal Communications Commission (FCC) reports that competitive local exchange carriers (CLECs) now garner 16.3 percent of the market, leaving the remaining market share to the incumbent local exchange carriers (ILECs). However, these statistics do not include competition from wireless telephones, high-speed data services, and Internet telephone services. If wireless telephone services were found to be substitutes for traditional telephone services (referred to in this paper as wireline services), then this competition, not to mention competition from other technologies, would replace the need for the regulations that control the wireline incumbent's prices and services.

The purpose of this paper is to examine the evidence on the degree to which wireless services are replacing wireline services. In addition, this paper estimates the extent to which increases in wireline prices would affect wireless demand. If wireless services are substitutes for wireline services, then an increase in wireline price should increase the demand for wireless services. This paper will test if this, in fact, is the case. A summary of the paper's key findings is as follows:

- Wireless and wireline services target similar markets, provide similar consumer benefits, and are similarly priced. Thus, wireless services can be suitable substitutes for traditional telephone services.
- In fact, overwhelming evidence shows that wireless services are replacing wireline services. While wireless service demand is on the rise, wireline service demand – measured in terms of primary telephone lines, additional telephone lines and telephone usage – is declining. For example, the Bureau of Census reports that wireless users are beginning to disconnect the wireline services into their homes. Similarly, numerous reports suggest that many consumers consider their wireless telephone as their primary telephone. There is also evidence that small businesses are beginning to use wireless services to replace traditional wireline services. Today, three wireless subscribers are added for every telephone line lost.
- Wireless services have become a widely accepted choice for consumer telecommunications needs. For example, wireless services have gained widespread popularity among young consumers and those on college campuses. For instance, one

study suggested that college students using wireless services are more likely to use wireless services instead of wireline services after graduating.

- Based on an econometric model, this paper finds conclusive evidence that wireless and wireline services are substitutes. This model finds that a one percent increase in wireline prices will result in a two percent increase in wireless demand. In other words, there appears to be statistically significant evidence that wireless competition prevents wireline prices from rising excessively. That suggests that market forces are at work.
- In addition to wireless services, intermodal competition is also taking shape in the form of 28 million high-speed service connections, as well as Voice-over-Internet Protocol (VoIP) that threaten to drive telephone rates lower. The combination of wireless, high-speed and VoIP services makes traditional telephone services seem antiquated.

In summary, this paper finds convincing empirical evidence that wireless services are strong substitutes for wireline services. This fact has significant implications on competitive and regulatory policies. For example, if wireline service providers cannot raise prices without causing significant line loss to wireless providers, then it can be concluded that wireline service providers are unable to exert market power. Furthermore, as wireless prices continue to fall, wireline providers will be under increasing market pressure to follow suit, in order to stem market share losses. That conclusion means that the nature of competition has changed, and it also means that price and service regulation is largely unneeded, since market forces are sufficient to hold prices in check.

Introduction

There are various modes of communications services– traditional telephone services (referred to as *wireline services*), radio telecommunications (referred to as *wireless telephone services*), satellite, cable and broadcast TV, and radio. These modes of communication utilize very different technologies and architectures to transport voice, data, and video information to consumers. Wireless telephones are as common in the U.S. as wired telephones are. Today, homes and businesses are using advanced services to connect to the Internet, and carriers are providing voice, data, and video services, effectively making traditional telephone services look obsolete. In many cases, these modes of communications appear to compete with one another, in what has been commonly referred to as *intermodal competition*.

Carriers are providing voice, data, and video services, effectively making traditional telephone services look obsolete.

While these alternative forms of communications have experienced double-digit growth, demand for traditional wireline services has fallen. This fact, coupled with anecdotal information that consumers are beginning to cut back on their wireline use, has led to a widely accepted view that wireless (not to mention advanced services) are replacing traditional wireline telephone services. However, there is a view that wireless services are not competitive with wireline service.[1]

Whether wireless services are substitutes for wireline services is a hypothesis that can be empirically tested. This paper reviews the available evidence on wireless substitution.

Do Wireless Services Substitute for Wireline Services?

Before beginning this analysis, it is important to define exactly what a substitute is. Two goods are considered to be *substitutes* when consuming one good leads to less consumption of the other good. Substitute goods can have different prices and levels of quality, differences that consumer preferences can sort out. While substitutes need not be identical products, they do need to serve overlapping markets, provide similar consumer benefits, and sometimes be sold in a similar unit of measure. For example, while not identical, a bottle of cola and a can of lemonade are considered substitutes, since they compete against one another for the same customers and provide similar benefits. If wireless services substitute for wireline services, they are competing services, similarly addressing overlapping markets and providing similar benefits.

However, consumption of wireless and wireline services could be completely unrelated, which would classify them as extraneous goods. Goods are extraneous if the consumption of one good has no influence on the consumption or price of some other good. For example, the consumption of yarn may have no effect on the consumption of caviar, since their consumption varies independently and they serve very different market needs. Finally, if goods are not substitutes, they could be complements, where the consumption of one good increases the consumption of another good. For example, an increase in the consumption of coffee will, for some consumers, increase the consumption of cream. In effect, these goods do not compete but go hand-in-hand together.

Indeed, 23 percent of all voice minutes are now wireless minutes, compared to 7 percent just three years ago.

Some people claim that wireless services are not substitutes for wireline services because very few consumers have "cut the cord" and become solely wireless users. While the FCC reports that 5 percent to 6 percent of consumers have only wireless phones,[2] that statistic says very little about the substitutability of the two goods, since consumption between wireless and wireline services need not be mutually exclusive. For instance, cola and lemonade are substitute goods, but that does not mean that cola drinkers must always choose cola. A cola drinker can still, at times, drink lemonade, and vice versa. Similarly, wireline subscribers could still substitute their calling by using wireless services without actually cutting the cord; they might eliminate second telephone lines or simply reduce wireline usage. Indeed, 23 percent of all voice minutes are now wireless minutes, compared to 7 percent just three years ago.[3]

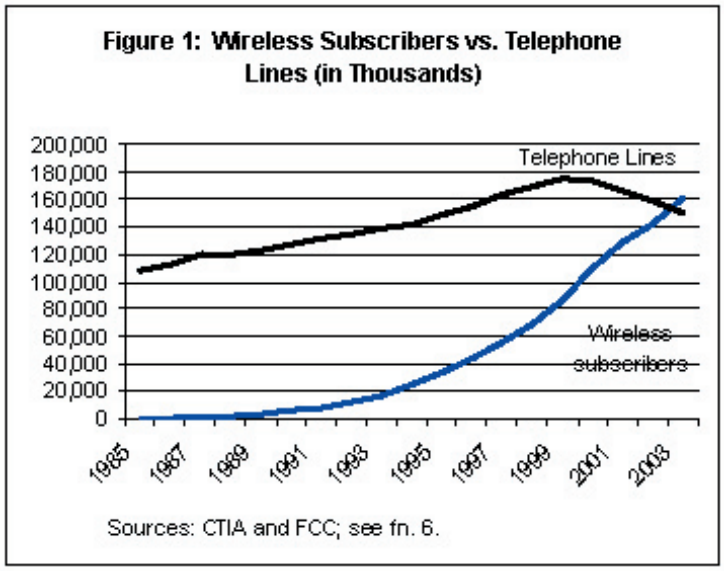
The next section will review the evidence on whether wireless services serve the wireline market and whether these services are comparable to wireline services.

Evidence of Wireless Competition

In the twenty years since the first cellular service was offered, wireless telephony has penetrated the consumer market and appears to be a major threat to wireline telephony providers. The Cellular Telecommunications & Internet Association (CTIA) reports that there are nearly 171 million mobile wireless subscribers in the United States.[4] In fact, as Figure 1 shows, wireless telephone services are now the most popular mode of telecommunication services, surpassing wireline telephone services for the first time. Wireless subscriber growth (13 percent in 2003) continues to outpace telephone access line (a circuit that connects a subscriber to a switching center) growth, which has steadily decreased (-6 percent in 2003).[5] One obvious

reason for wireless services popularity is its convenience, permitting consumers to make calls from their homes or on the road.

In order to evaluate the evidence on wireless substitution, it is helpful to analyze the degree to which wireless services are functionally comparable, serve similar markets, and are comparably priced with wireline services. If this proves to be the case, then wireless services would appear to be suitable substitutes for wireline services, at least for some consumers.



Wireless services are functionally equivalent to wireline services.

Comparable Services

Wireless services are functionally equivalent to wireline services. Besides providing local and long distance calling, wireless phones offer many of the same features, including voice mail, caller ID, speed dialing, and return call. In addition, like wireline telephone, wireless service offerings include measured service and flat rate service plans, as well as access to the Internet. Wireless telephone services are, therefore, functionally comparable to wireline telephone services. In fact, with the ability of wireless telephones to send pictures and text messaging, as well as programming and broadband services, wireless telephones may provide more capabilities than plain old telephone services.[6]

Comparable Prices

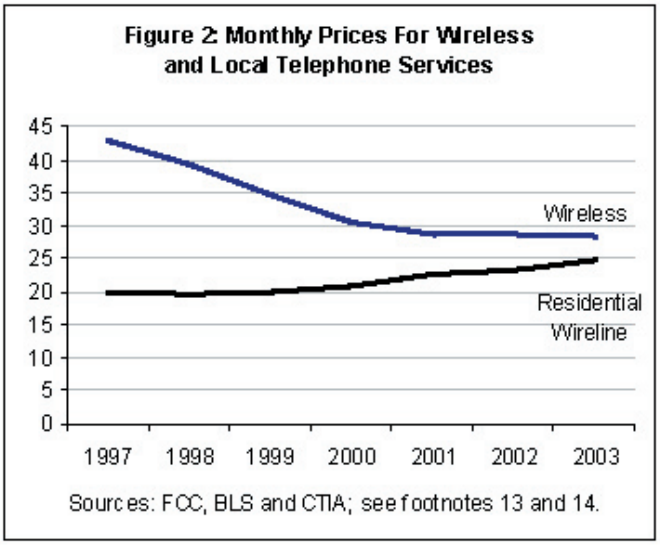
Wireless phones have become very affordable as prices have continued to drop. According to the Bureau of Labor Statistics, after adjusting for inflation, consumer prices for cellular phone service have fallen 51 percent since December 1997.[7] On a revenue per minute basis, wireless telephone service prices have decreased from $0.44 in

1993 to $0.10 in 2003, representing a 14 percent average reduction per year.[8]

According to some analysts, wireless services are less expensive than wireline services.[9] A review of average prices suggests that this could be the case. According to FCC data on local telephone rates, residential customers pay, on average, $20.48 per month (excluding taxes and universal service) and businesses pay on average $38.24 per month.[10] In comparison, T-Mobile offers national plans ranging from $19.99 per month to $39.99 per month.[11] Many wireless plans have usage limitations, but most plans include free minutes, free weekend calling, free evening calling, free paging, free first minutes, free in-network calling, and so on. While wireless services tend to offer these features at no additional charge, wireline services charge $10 or more for these features. Wireless plans were the first to bundle local and long distance calling, a package that wireline providers have now begun to offer.

Using the FCC's estimate of average monthly residential local telephone rates,[12] and allowing wireless prices to change based on changes in the consumer price index for wireless telephone services,[13] average wireline and wireless prices can be compared. As Figure 2 shows, wireless and wireline prices are converging. If $10 per month were added to wireline prices to compensate for the many free features available with wireless services (such as Caller-ID and speed calling), it is possible for wireless services to be cheaper than wireline services. Whether a consumer finds one service less expensive depends on the wireless plan, the wireline plan (business versus residential line), the service provider, the features, and the customer's actual usage. Either way, it appears that wireless services can compete against wireline services based on price.[14]

In short, depending on the needs of consumers, wireless services are comparably priced with wireline services ...



Monthly prices aside, there are still other ways that consumers can save when buying wireless services. Wireless carriers sell wireless telephones to customers at heavily discounted rates, sometimes free of charge, while incumbent wireline carriers do not. As for installation, the cost of connecting a wireless subscriber is a one-time fee of about $35.[15] In comparison, wireline services charge, on average, $40.76 for residential services and $72.62 for business services, with additional charges for establishing a new service (the costs of deploying a drop line and connection block average $5.85 for residential and $6.52 for business), if needed, as well as inside wire maintenance plans (with lowest prices averaging $3.64 for residential and $4.95 for business).[16] To connect a wireline customer takes days, while to activate a wireless subscriber takes minutes. In short, depending on the needs of consumers, wireless services are comparably priced with wireline services, if not lower priced, and wireless prices continue to fall.

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Comparable Calling Areas

According to the FCC, "an increasing number of mobile carriers offer service plans designed to compete directly with wireline local telephone service."[17] The FCC cites several carriers offering unlimited local calling plans, such as the "Around Town Phone" plan offered by Leap's Cricket subsidiary.[18] Leap and MetroPCS claim their wireless customers average as many minutes per month as wireline customers do.[19] AT&T and its affiliates, such as SunCom, have had plans that give unlimited local calling as long as the calls originate within a predefined local calling area. In effect, these local wireless plans compete against local wireline plans. Wireline and wireless services are clearly targeting the same customer market segment.

Quality and Dependability

While wireless quality of service is sometimes noted to have shortcomings—such as more dropped calls, longer setup times and lower voice clarity—wireline services cannot match the accessibility that wireless services bring to consumers who want to stay in touch with others and not wait for their home phones to ring. For example, wireless calls can be made or received in homes, moving vehicles, boats, planes, and subway cars. Consumers can take their wireless telephone service with them on vacation, to work, and sometimes when they change addresses. However, wireline phones are hopelessly tethered to the wall.[20] While wireless phone quality can suffer from the occasional dropped call in a moving vehicle, once consumers leave their home, wireline phones do not work at all. Simply put, wireless services offer an unmatched level of versatility,

Wireline and wireless services are clearly targeting the same customer market segment.

superior flexibility, and convenience for consumers reluctant to wait by their wired phone. Unlike wireline telephones, wireless telephone services also do not suffer from line troubles and are installed more quickly. In summary, versatility and convenience are important aspects of service dependability that wireline telephones cannot match.

Competitive Pressure

Consumers can choose among many wireless services and service providers. There are six national wireless telephone providers, four major regional providers, resellers, satellite providers, high-speed wireless services, and various non-voice providers, including paging and mobile data providers.[21] Within mobile telephone providers, three or more competitors have built networks capable of reaching 97 percent of the U.S. population, and six or more wireless competitors can reach 76 percent of the population.[22] With so many wireless networks and service providers, prices are highly competitive. Therefore, if wireless services are substitutes for wireline services, then wireless providers offer choice and competitive prices for consumers.

Changes in Consumer Preferences

Because wireless telephony fits the hurried lifestyle of some, particularly younger consumers, it has become an accepted part of their demand for telecommunications services. The FCC cites a Telephia survey that most (56 percent) 11 to 17 year olds share or have a cell phone, as do nearly one-third of eight to 10 year olds.[23] As these young consumers become accustomed to wireless phones, text messaging, and instant messaging, they learn to be less dependent on wireline services.

The adoption by young consumers and bypass of wireline services is nowhere more evident than on college campuses. Some colleges and universities that provide telephone services to students on campus have lost hundreds of thousands of dollars, as more students are disconnecting the university's wireline service in favor of the wireless service of their choice.[24] According to one report, the revenue of university-supplied telephone services has fallen 40 percent.[25] Another university reported that its students are using 90 percent fewer lines than a few years before, opting instead for wireless services.[26] The Yankee group reported that students who rely on wireless services today are more likely to use wireless over wireline services after graduating.[27]

The elderly are also adopting wireless technologies. One survey estimated that 47 percent of AARP members have switched or have

considered switching their wireline service to a wireless service, and that wireline costs are a major reason.[28]

Erosion of Traffic

Consumers are regularly using wireless services to make calls that once were made by wireline services. While wireline access lines and minutes have been decreasing, wireless subscribers and minutes have increased. According to FCC data, access lines have declined 15 percent since 1999, and those keeping their wireline telephone services are making fewer long distance and local calls.[29] Since 1998, there are 11 percent fewer local calls per access line. Overall, there are 23 percent fewer local calls reported to the FCC. In contrast, wireless services are experiencing double-digit growth and minutes per call has increased from 140 monthly minutes per subscriber in 1993 to 507 minutes in 2003, including a 19 percent increase in usage per subscriber in the last year.[30] The FCC states, "there is much evidence… that consumers are substituting wireless services for traditional wireline communications,"[31] and cites testimony that wireless providers have "siphoned" away 30 percent of all wireline traffic.[32] In many countries, wireless telephone penetration has leapfrogged wireline penetration. In the U.S., public telephone services are in decline and profits are down.

The Yankee group reported that students who rely on wireless services today are more likely to use wireless over wireline services after graduating.

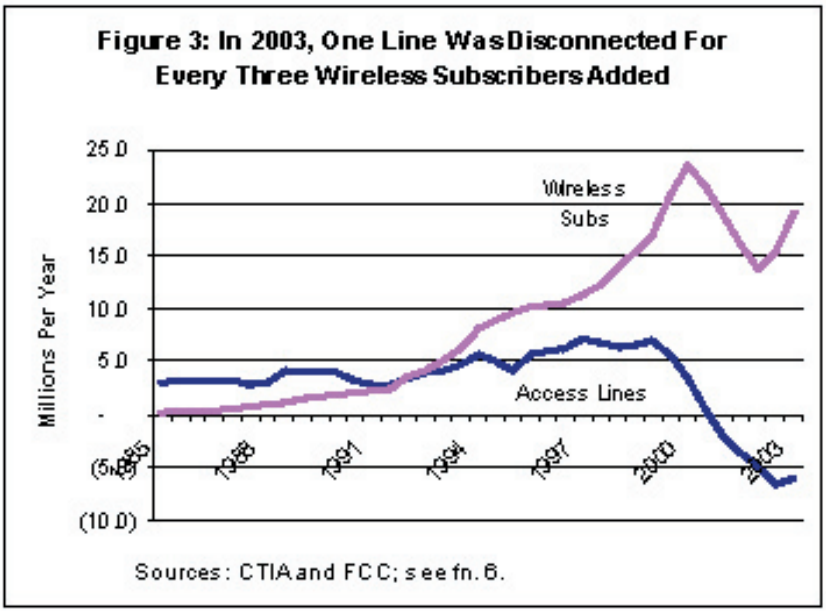
Replacing wireline services has become easy and transparent to the calling public. A consumer can sell his home, move across town, and take his wireless telephone number with him at no charge, a feat seldom possible with traditional wireline providers. Moreover, the FCC now permits consumers to keep the same telephone number when they switch from a wireline service to a wireless service.

The degree to which wireless technology is replacing wireline service is appearing in the basic data, as well as research studies. As Figure 3 shows, consumers are disconnecting their wireline services, while at the same time wireless services continue to grow. In 1985, there were 14 telephone lines installed for every wireless subscriber added. Today, there is roughly one access line lost for every three wireless subscribers added, and average usage per wireless subscriber continues to increase. Second lines to homes declined by 7.5 million lines from 2000 to 2002. Primary lines also appear to be effected, according to the Bureau of Census, where 5 percent to 6 percent of wireless customers report no wireline telephone.[33] In short, consumers buying wireless phones appear increasingly comfortable with disconnecting their tethered services.

In many countries, wireless telephone penetration has leapfrogged wireline penetration.

Mounting empirical evidence supports this growing trend in wireless substitution. Five years ago, Southern Media & Opinion Research found that nearly half of wireless subscribers made the majority of their calls from their mobile telephone, rather than from their home telephone.[34]

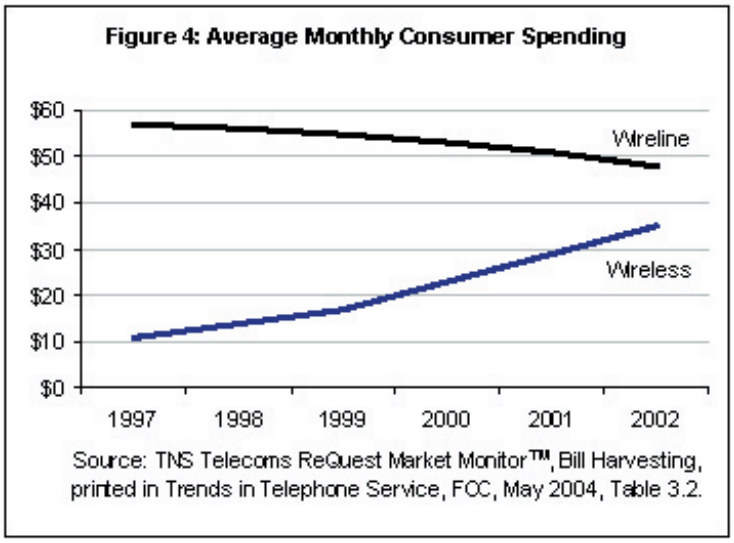
A study conducted in 1998 by M/A/R/C Research found that 16 percent of wireless subscribers used their wireless service to replace wireline services.[35] The following year, Peter D. Hart Research Associates reported that 38 percent of wireless customers had at least some interest in using wireless to replace their home telephone use.[36] Thomas J. Sugrue, former Chief for the FCC's Wireless Bureau, noted the growing popularity of wireless as a substitute for wireline services among the FCC staff.[37] Last year, consumers made 73 million emergency or 911 calls using their wireless telephones.[38] Without wireless devices, these emergency calls would certainly not have been reported. That fact suggests that wireless emergency calls even replace wireline emergency calls.



There is still other evidence that this trend of wireless substitution is truly a competitive threat to wireline services.[39] International Data Corporation estimated that 10 million access lines were displaced at the end of 2001.[40] In its report to Congress on June 13, 2002, the FCC reported a USA Today/CNN/Gallup poll indicating that 18 percent of wireless users considered their wireless telephone to be their primary telephone. More recently, Leap reported that 43 percent of its customers do not have a wireline telephone.[41] A Yankee Group report found that over 25 percent of households have replaced some wireline usage with their wireline telephone, and over 20 percent have replaced a significant amount of usage, some completely replacing their wireline telephone.[42] Another study found that one in three consumers would cut their local telephone service if wireless prices fell further and coverage improved.[43] According to In-Stat/MDR, nearly 30 percent of wireless subscribers will be disconnecting their wired telephone service by 2008.[44] As Figure 4 shows, while

consumers are paying lower prices for wireless services, as market penetration grows, consumers are spending more on wireless services and less on wireline services. Clearly, consumers are trading-off wireline services for wireless services.

Wireless services are increasingly in demand for business users, too.[45] In 2000, Insight reported that there were 46 million wireless business subscribers in the U.S.[46] One survey reported that 73 percent of small business subscribed to wireless telephone services.[47] In terms of telecommunications expenditures, small businesses spent on average $176.44 per month for wireless services, compared to $179.93 and $150.47 per month for local and long distance services, respectively.[48] That same survey found that six percent of the small businesses reported wireless spending, but had no long distance spending; and that four percent of small businesses reported wireless spending, but had no local telecommunications spending.[49] Furthermore, the advent of wireless area networks makes inside wiring unnecessary.



According to In-Stat/MDR, nearly 30 percent of wireless subscribers will be disconnecting their wired telephone service by 2008.

In summary, empirical evidence confirms that many consumers, including small businesses, consider wireless telephones to be a substitute for wireline services. Wireless substitution appears to be a significant and growing trend. As the number of wireless subscribers eclipses the number of access lines, regulations once put in place to protect consumers against the formerly dominant ILECs have become obsolete. If encouraging telephone competition benefits consumers and the economy, then rules for managing competition must be rethought to recognize the reality of intermodal forms of competition.

A Statistical Model of Substitution

The extensive evidence presented in this paper supports the hypothesis that wireless services substitute for wireline services. Statistical evidence also supports that hypothesis. One study found strong and statistically significant evidence that wireless and wireline services were substitutes,[50] while another study found that wireless telephone services were replacing second telephone lines.[51] In order to assess the degree to which wireless substitution puts pressure on wireline prices, an econometric analysis was performed. Using these earlier studies as a guide, the following wireless demand model was constructed:

$$\mathbf{Q_i} = \alpha + \beta_1\mathbf{P}_i + \beta_2\mathbf{W_i} + \beta_3\mathbf{S_i} + \beta_4\mathbf{M_i} + \beta_5\mathbf{I_i} + \varepsilon_I$$

Where, for the ith observation,

- ***Q*** is the demand for wireless services;
- α is a constant;
- ***P*** is the price for wireless services;
- ***W*** is the price for wireline services;
- ***S*** is a binary variable for seasonal variation;
- ***M*** is a binary variable for substitution effects;
- ***I*** is the income of the market;
- β_1, β_2, β_3, β_4 ***and*** β_5 are the estimated coefficients of the modeled variables **P, W, S, M and I** (respectively); and
- ε is an error term.

Wireless substitution appears to be a significant and growing trend.

Data were collected semi-annually from 1984 to 2003. Demand (Q) was measured as the number of wireless subscribers and is based on survey results published by CTIA.[52] Average wireless revenues per subscriber were used to develop a historical index for wireless price (P). However, since the Bureau of Labor Statistics (BLS) has maintained a price index in recent years, the BLS' CPI for wireless service index was linked to the historical series starting in 1997. Consistent with microeconomic theory, wireless prices are expected to be inversely related to demand, indicating that a decrease in wireless prices would produce an increase in wireless demand.

Average wireless revenues per line is a good approximation for measuring changes in wireless prices in the absence of better price information from the BLS. However, changes in average wireless revenue per subscriber can be the result of variability in either wireless prices and the composition of consumers. Over the years, the composition of wireless subscribers has changed from predominantly business subscribers to a mix of business and

residential subscribers. Because residential subscribers (at least early on) tended to use their wireless service less frequently than business customers, sometimes reserving their wireless service for emergency calling, the change in customer composition affected average revenues independent of the change in price. Another study also found that decreases in average revenue per subscriber in the early years (i.e., 1984 to 1989) reflected both price decreases as well as a change in the mix of customers from primarily business customers to lower usage residential customers.[53] Therefore, this paper's model includes a variable (M) to discern changes in the mix of customers from changes in wireless price (P). The expectation is that this mixed-effect variable will be positively correlated to wireless price, indicating that not all of the reduction in average revenue per subscriber reflects a reduction in wireless prices.

The model of substitution also includes a variable for the price of wireline services (W). The price of wireline services was estimated by a weighting the Producer Price Index series for local telephone services, the Producer Price Index for toll and long distance services, and an index of subscriber line charges.[54] The demand for wireless services should be positively related to the price for wireline services, indicating that an increase in wireline prices will increase wireless demand. This, essentially, demonstrates the extent to which wireless competition acts to hold wireline prices in check. If the estimated coefficient ($\beta 2$) for W turns out to be negatively related, then wireless and wireline services may be complementary goods. If the estimated coefficient turns out to be not statistically different from zero, then the wireless and wireline services may be unrelated or extraneous goods. In sum, the hypothesis that wireless and wireline services are substitutes will be rejected unless the estimated coefficient is positive and statistically significant.[55]

Three statistical regressions were run. In the first regression, income effects (I) were accounted for by using real Gross Domestic Product (GDP) per household. In a second regression, real disposal income was used instead of GDP. A third regression omitted an income variable. In addition, the model includes a variable (S) to account for seasonal differences between mid-year and end of year data. It may be, for example, that vacation homeowners subscribe to a wireline service in the summer, but disconnect their vacation homes in the winter. This variable will control for this and any other seasonal fluctuation that may exist in the data.

Before discussing the results, it is helpful to emphasize some of the important information that the model results will provide. Specifically, the model estimates the price elasticity of demand (i.e., the sensitivity of changes in wireless demand to changes in price),

and it estimates cross-elasticity (i.e., the sensitivity of wireless demand to changes in wireline price).[56] The elasticity term measures the percent change in wireless demand resulting from a percent change in wireless price. This can be useful in estimating how much wireless demand will increase given a decrease in wireless prices. In other word, wireless prices should be negatively correlated to wireless demand.

The cross-elasticity term measures the percent change in wireless demand resulting from a percent change in wireline price. This can be important in estimating how much wireless demand will increase given an increase is wireline services. Wireline prices should be positively correlated to wireless demand. As mentioned earlier, this latter estimate provides a direct test for the hypothesis that wireless and wireline services are direct substitutes. Figure 5 shows the model results.

FIGURE: 5
Wireless Demand Analysis
Estimated Coefficients (T-Statistics in Parenthesis)

	Model #1	Model #2	Model #3
Constant			
	0.077	0.099	0.094
	(2.86)	(4.05)	(5.83)
Wireless Price			
	-0.564	-0.560	-0.559
	(-6.63)	(-6.53)	(-6.62)
Wireline Price			
	1.836	1.952	1.936
	(2.36)	(2.51)	(2.54)
Seasonal Binary			
	0.055	0.054	0.054
	(2.73)	(2.64)	(2.71)
Mixed Effects			
	0.167	0.173	0.172
	(7.12)	(7.54)	(7.70)
Real GDP / HH			
	0.870		—
	0.79	—	
Real Disp. Income / HH			
	—	-0.220	—
		(-0.24)	
Adjusted R2			
	.829	.826	.830
F-Test			
	36.8	36.1	46.4

The models meet and pass a number of important statistical tests for judging the strength and reliability of the results. A measure of explanatory power (R^2) indicates that the models explain 83 percent of the total variation in wireless demand, confirming that the models are a good fit for the data. The modeled equations are highly significant, as measured by the F-test, confirming that the models' correlation is not just a random occurrence. Except for income, all of variables in all three models are statistically significant, supporting the model's hypotheses and indicating that the correlation between wireless demand and these variables are not by chance. In all of the models, all of the statistically significant variables have the correct signs, meaning that they are positively and negatively correlated as expected. In terms of consistency with earlier work, the regression model's estimate of price elasticity for wireless services is similar to estimates from prior studies.[58] Therefore, based on various statistical tests, the results provide statistically valid evidence.

The models provide compelling empirical evidence that wireless and wireline services are indeed substitute goods,

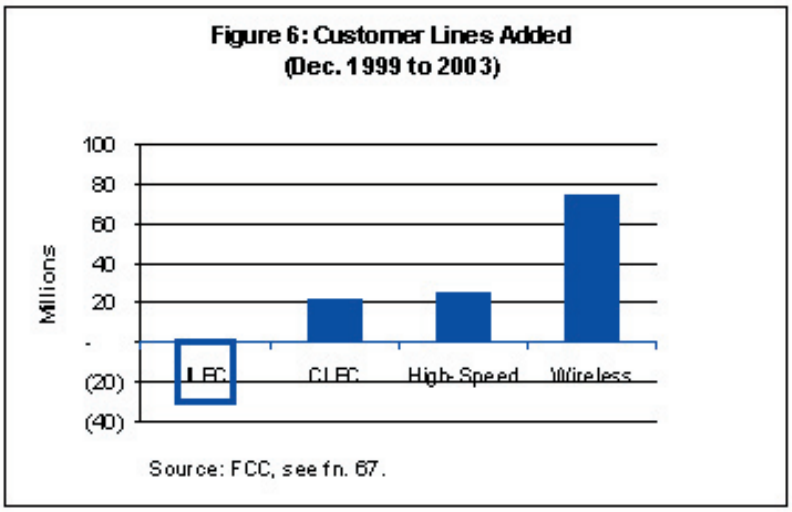
Most importantly, however, the models provide compelling empirical evidence that wireless and wireline services are indeed substitute goods, and are not extraneous or complementary goods. Results from all three models confirm the cross-elastic terms to be positively correlated, large in magnitude and statistically significant. For example, the models estimate that a one percent increase in wireline prices would result in nearly a 2 percent increase in wireless demand.[59] In other words, if wireline carriers were to increase their prices, wireless service providers would gain a substantial number of subscribers. This finding, coupled with the fact that wireless prices continue to decrease, suggests that wireline providers may soon be under pressure to decrease prices in order to stem market share losses.[60] In effect, wireless competition can hold wireline prices in check, mitigating any market power that wireline services once had. These results suggest that intermodal model competition is effective competition.

Broadband and Other Competition

There are other modes of competition for local telephone services that are not included in conventional measures of competition. One notable source of competition is from broadband, also known as high-speed services. According to the FCC, as of December 31, 2003, there were 28 million high-speed lines, more than half being coaxial cable high-speed lines operated by Cable TV companies.[61] These high-speed services reduce local circuit-switched traffic, and also reduce the need for local telephone company lines, including second telephone lines and fax lines. Not only are these high-speed services replacing dial-up lines, but they are also substituting for telephone functionality. According to the *Wall Street*

Journal, high-speed data services, along with wireless services, have become a serious competitive threat to traditional wireline services.[62]

Besides cable modem and digital subscriber line services, there are other forms of high-speed services. Third-generation wireless phones threaten wired phones, not just in terms of convenience, but also by offering high-speed functionality.[63] Wi-Fi and WiMax are among other wireless broadband options currently being deployed that threaten the longevity of wireline communications.[64] Satellite services are also capable of voice, data, and video services. In addition, electric power lines can serve as broadband lines, potentially reaching every household in the U.S.[65] The growth of wireless services, broadband, and other forms of intermodal competition are primarily responsible for the decline in ILEC lines shown in Figure 6.[66] This is a historical shift and represents the first decline in ILEC lines in the postwar era.



...the models estimate that a one percent increase in wireline prices would result in nearly a 2 percent increase in wireless demand.

High-speed services are making traditional telephone services obsolete because they can transport video and data, as well as voice services. Virtually every major cable and telephone company now offers telephony services based on Voice-over-Internet Protocol. VoIP services and call-management features, such as call waiting, voice mail, IP teleconferencing, and virtual public branch exchange (commonly referred to as PBX) services, are examples of some of the Internet-based services that replace common features offered by local telephone service providers. Today, residential VoIP services are priced lower than traditional wireline services.[67] In addition, small businesses have begun using VoIP services.[68] Furthermore, other communications alternatives, such as e-mail, instant messaging and text messaging, have become an accepted means of communication that substitute for traditional telephone calling.

In summary, intermodal competition represents real competition for traditional telephone services. The presence of competition can permit policymakers to rely on market forces, rather than regulations, for setting prices and managing service providers. Evidence presented in this paper suggests that wireline customers are cutting the cord and that migration off the wireline network would accelerate if traditional wireline service providers attempted to raise prices. Intermodal competition can be a key factor in achieving a competitive market.[69]

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Conclusion

Numerous studies and trends show that wireless services are replacing wireline services. This paper offers statistically significant evidence that a change in wireline prices would produce a large increase in wireless demand. That fact, supported by a host of studies from other sources, suggests that wireless services are replacing wireline services. In addition to wireless competition, broadband and VoIP competitors are beginning to provide traditional wireline services with stiff intermodal competition. If wireline providers are unable to raise prices without creating a significant decline in demand, as shown in this paper, then intermodal competition mitigates the presence of market power and, therefore, the need for government regulation of the telecommunications marketplace.

Notes

[1] Recent views that wireless service providers are not competitors with wireline providers are expressed in "Intermodal Competition in Telecom: A Vision, not a Reality," A Resource Guide by CompTel/Ascent, Washington, DC, May 19, 2004; and "Fixed-Mobile 'Intermodal' Competition in Telecommunications: Fact or Fiction?" Phoenix Center for Advanced Legal & Economic Public Policy Studies, Washington, DC, March 31, 2004.
[2] "Ninth Annual CMRS Competition Report," Report to Congress, FCC, September 9, 2004, par. 212 and fn. 575, citing the Current Population Survey of the U.S. Census Bureau.
[3] Ibid, par. 213.
[4] The figure came from their homepage www.ctia.org as of Oct. 27, 2004.
[5] Data from "CTIA's Semi-Annual Wireless Industry Survey," CTIA, Washington, DC, 2004, (also see www.CTIA.org); and the Automated Reporting Management Information System (ARMIS), Report 43-08, Table IV (also see www.fcc.gov) covering the incumbent local exchange carrier's switched access lines.
[6] For example, see Roger O. Crockett, "Wireless," Business Week, The 2004 Info Tech 100, June 21, 2004, states "Finally, serious cell-phone capabilities are rolling in. Imagine your next phone as a TV, Radio and Videocam."
[7] Prices were downloaded from the Bureau of Labor Statistics at www.BLS.Gov for the Consumer Price Indexes (specifically, CPI-U) for cellular telephone services and all items, as of September 2004.
[8] "Ninth Annual CMRS Competition Report," Appendix A-11, Table 9.
[9] Ibid, par. 214.
[10] Paul R. Zimmerman, "Reference Book of Rates, Price Indices, and Household Expenditures for Telephone Service," FCC, 2004, Tables 1.1 and 1.8.
[11] This information was taken from T-Mobile's Web site. Other wireless carriers offer similarly priced plans, though minutes and terms may vary.
[12] Paul R. Zimmerman, Table 1.1. This data is for unlimited calling, sometimes referred to as *flat-rated* service. The use of residential local rates to compare wireless rates is very conservative, since business local rates are approximately twice as high as residential rates, making them higher than many wireless plans.
[13] In recent years, wireless services have offered picture and text messaging, online services and more generous calling plans – all at extra charges that are reflected in industry revenue data, but not necessary affecting price. For this reason, average revenue per subscriber is an imperfect measure of wireless price. In order to control for the recent mix effects and inclusion of non-voice services, a price series was constructed using the mid-1997 average wireless revenues per subscriber (from CTIA's Semi-Annual Wireless Industry Survey) linked to consumer price changes to the Bureau of Labor Statistics price index for wireless telephone services (CPI-U data is available at www.bls.gov).
[14] Wireless second lines may also be cheaper than wireline prices. Depending on the provider, adding a second wireless line can cost as little as $10 more a month, while adding a second wireline essentially doubles a customer's local telephone bill.
[15] Again, prices and fees vary by provider.
[16] Paul R. Zimmerman, Tables 1.1 and 1.8.
[17] "Annual Report and Analysis of Competitive Market Conditions With Respect to Commercial Mobile Services," FCC, Seventh Report, released July 3, 2002, at Section II.A.1.e.ii. Also see "Ninth Annual CMRS Competition Report," par. 215.
[18] Ibid.
[19] Ibid. In the FCC's Seventh report the cite Leap's claims that its customers average 1,150 minutes per month; in the FCC's Ninth Report they cite MetroPCS' claim that its customers average 1700 minutes per month. Wireline customers average about 1,200 minutes a month, though this average appears to be falling in recent years, possibly due to wireless replacement.
[20] Portable telephones are an exception, but their reach is still limited to the customer's premise and they have the same quality concerns that wireless services are sometimes cited as having.
[21] "Ninth Annual CMRS Competition Report," pp. 36-43.
[22] Ibid, Appendix A-11, Table 10.
[23] Ibid, p. 87, par. 211 and fn. 573.
[24] Stefanie Frith, "Students' Cell Phones Cost Colleges," *Associated Press*, New York, June 24, 2002.
[25] "Colleges Get Wake-Up Call from Cell Users," *San Diego Business Journal*, Sept. 23, 2002.
[26] David Hayes, "Wireless' Campuses Take Off," Bits & Bytes, *Kansas City Star*, Sept. 14, 2004. (Downloaded from www.kansascity.com). The article reports a Yankee Group finding "College campuses act as a valuable test bed for new technologies and students are leaving the campus bubble with demand for the same technologies" Yankee Group, Boston, MA, August 10, 2004, downloaded in September at www.yankeegroup.com/public/products/research_note.jsp?ID=11801.

[27] Ibid.
[28] "Wyo. Elderly Thinking More of Going Wireless," *USA Today*, posted Aug. 20, 2004, downloaded from www.usatoday.com.
[29] This information is from the Automated Reporting Management Information System (ARMIS), Report 43-08, Table III and IV for the years 1991 to 2003 for all filing local exchange carriers.
[30] "Ninth Annual CMRS Competition Report," Appendix, A-11, Table 9.
[31] "Eighth Annual CMRS Competition Report," p. 49, par. 102.
[32] Ibid.
[33] "Ninth Annual CMRS Competition Report," par. 212 and fn. 575, citing the Current Population Survey of the U.S. Census Bureau.
[34] Edward Warner, "PCS May Allow BellSouth to Launch Long-distance," *Wireless Week*, 13 July 1998.
[35] Ibid.
[36] "Dynamics and Trends in the Wireless Marketplace," Peter D. Hart Research Associates, Inc., Washington, DC, January 1999, p. 6.
[37] Thomas J. Sugrue, Opening Remarks, Sixth Annual CMRS Competition Report, June 20, 2001. His presentation includes a chart entitled "Wireline Substitution in the Wiener-Goldstein Household" that shows how the Chief of the FCC's Auctions and Industry Analysis Division saved $8.45 per month by buying wireless services, instead of adding another telephone line.
[38] See www.ctia.org/public_policy/statistics/index.cfm/AID/216 (downloaded September 2004).
[39] A number of studies that support a wireless substitution trend are identified in the FCC's Seventh Annual CMRS Competition Report, released July 3, 2002.
[40] "IDC Says, It's a Wireless Boom as More People Cut the Cord," *IDC Pulse*, International Data Corporation, Jan. 16, 2002.
[41] Ninth Annual CMRS Competition Report," p. 89, par. 215.
[42] See Christopher Rhoads, "Outside the Lines," *Wall Street Journal*, Sept. 13, 2004, p. R-6.
[43] "1 in 3 Americans Would Cut the Local Phone Cord and Switch to Cell, U.S. Survey Finds," LetsTalk, San Francisco, June 24, 2004.
[44] As reported by Antone Gonsalves "Wireless-Only Subscribers Increasing*," InformationWeek*, Feb. 25, 2004, www.informationweek.mobilepipeline.com.
[45] Trevor Marshall, "Working With Wireless," CNS Magazine, March/April 2004.
[46] See "Wireless Data, Wireless IP, and Vertical Markets: 2001-2006" Insight Research Corporation, as reported at www.insight-corp.com/reports/wdata/asp (downloaded Oct. 12, 2004).
[47] Stephen B. Pociask, "A Survey of Small Businesses' Telecommunications Use and Spending," for the SBA Office of Advocacy, under contract SBAHQ-02-M-0493, March 2004, p. 44, Figure 30.
[48] Ibid, p. 10, Figure 2. Of those small businesses subscribing to wireless services, spending averages $239.37 per month (see Ibid, p. 45, Figure 31).
[49] Ibid, p. 2.
[50] *Deregulation and Consolidation of the Information Transport Sector: A Quantification of Economic Benefits to Consumers*, Joel Popkin and Co., Washington, DC, Sept. 29, 1999, pp. 28-31.
[51] Mark Rodini, Michael R. Ward and Glenn A. Woroch, "Going Mobile: Substitutability Between Fixed and Mobile Access," Prepared for the Conference on "Competition in Wireless," Public Policy Research Center, University of Florida, Gainesville, FL. Feb. 2002, paper dated Dec. 2002.
[52] CTIA's Semi-Annual Wireless Industry Survey, CTIA, Washington, DC, 2004, (www.CTIA.org).
[53] *Deregulation and Consolidation of the Information Transport Sector: A Quantification of Economic Benefits to Consumers*, p. 29. This was accounted for using a binary variable (a value of 1 for the period cited).
[54] Produce Price Indexes came from the BLS; subscriber line charges came from FCC's "Trends in telephone service;" and revenues used for weighting came from the historical series found in the FCC's "Statistics of Common Carriers." A Divisia index was calculated using the Tournqvist-Theil method for discrete approximation.
[55] The 95% confidence limit will be used.
[56] The ordinary least squares model presented in this paper utilizes a difference of log specification, so that the coefficients for variable P and W represent the price elasticity for wireless services and cross-elasticity of wireless services for wireline services, respectively.
[57] All T-statistics in these three model results meet or exceed the critical T at the 95% level of confidence, except for real GDP and real disposable income per household.
[58] One study found the price elasticity to be –0.60 (see Rodini, Ward and Woroch, 2002). Two older studies estimated wireless service price elasticity to be around -0.5 (see Jerry Hausman, "Cellular Telephone, New Products and CPI," NBER Working Paper, p. 9; and *Deregulation and Consolidation of the Information Transport Sector: A Quantification of Economic Benefits to*

Consumers, p. 29).
[59] As **Figure 5** shows, the coefficients for wireline prices are between 1.8 and 2.0.
[60] One statistical study found that 57% of consumers would be willing to drop their wireline plan for a $35 per month 600-minute anytime wireless plan (see Kevin T. Duffy-Deno and Richard S. Sewell, "Mobile Wireless as a Substitute for Primary Fixed Line Service: What is the Potential Impact?" Ernst & Young, LLP and PriMetrica, Inc., Version 1.0, May 22, 2003.
[61] "High-Speed Services for Internet Access: Subscribership as of December 31, 2003," FCC, June 2004, Table 1.
[62] See Shawn Young, "More Callers Cut Off Second Phone Lines for Cell Phones, Cable Modems," *The Wall Street Journal*, Nov. 15, 2001, B1; and Almar Latour, "It's a Mad, Mad, Mad Telecommunications World, *Wall Street Journal*, September 13, 2004, p. R1.
[63] "More Than Just Phones; Third-Generation Phones Transmit Huge Amount of Complex Data at High-Speeds," *Greensboro News Record*, Oct. 13, 2002.
[64]For example see, Matthew Yi, "Widening Wireless: New WiMax Technology Allows Broadband Users to Access Internet From More Places," *San Francisco Chronicle*, Sept. 27, 2004; and "Matthew Yi, "WiMax Could Be Next Big Leap in Technology," *San Francisco Chronicle*, Sept. 30, 2004.
[65] "FCC Adopts Rules for Broadband Over Power Lines to Increase Competition and Promote Broadband Service to All Americans," News Release, FCC, Washington, DC, October 14, 2004, www.FCC.gov.
[66] See "High-Speed Services for Internet Access: Status as of December 31, 2003," FCC, June 2004 and "Local Telephone Competition: Status as of December 31, 2003," FCC, June 2004.
[67] "Residential Internet Phone Service Rates Dropped by AT&T, Vonage," *Chicago Tribune*, Sept. 30, 2004.
[68] One study reported that 3.3% of small businesses use VOIP services. See Stephen B. Pociask, "A Survey of Small Businesses' Telecommunications Use and Spending," p. ii.
[69] See Elizabeth E. Bailey, "Contestability and the Design of Regulatory and Antitrust Policy," *AEA Papers and Proceedings*, 71:2, May 1981, pp. 181-182.

About the Author

For over twenty years, Stephen Pociask has conducted research for think tanks, associations and high-tech industries. As president of TeleNomic Research, a consulting firm specializing in public policy analysis, he is responsible for a wide variety of applied economic studies. A number of his studies are filed at both federal and state regulatory commissions, and recently have included topics such as effects of Internet taxation, universal service, and small business use of telecommunication services. Mr. Pociask has appeared before the FCC in its open forums and at its staff meetings. He has spoken to numerous state and local legislators on broadband issues, and testified before Congress on Internet and broadband legislation. He has written about deregulation, long-distance industry cost structure, local exchange competition, high-speed Internet deployment, the economics of multimedia data networking, and cable competition.

He has appeared numerous times in the media, including Bloomberg News, CNBC, Telecommunications Reports, Telephony, Congressional Quarterly, America's Network, NetworkMagazine and CNET Radio.

From 1998 to 2000, Mr. Pociask previously served as chief economist and executive vice president for Joel Popkin and Co., an economic consulting firm in Washington, DC. Before this assignment, he spent eighteen years working in the telecommunications industry. He has completed his Ph.D. coursework in economics and has an M.A. in economics from George Mason University.

Mr. Pociask can be reached at (703) 471-3954 or Steve@TeleNomic.Com.

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