A REPORT TO THE U.S. CHAMBER OF COMMERCE

SENDING THE RIGHT SIGNALS: PROMOTING COMPETITION THROUGH TELECOMMUNICATIONS REFORM

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ABSTRACT

Telecommunications is the central nervous system of the American economy. The firms in this sector provide local and long-distance voice communications, mobile phones, video, and high-speed data; invent the technologies to create and enhance these services; and manufacture the equipment to deliver them.

But since 2000, the industry has been extremely depressed. Although telecommunications accounts for only 0.9 percent of total U.S. employment as of May 2004, the 380,500 telecom and telecommunications equipment workers who lost their jobs between March 2001 and May 2004 make up 29 percent of total U.S. job losses over that period. The U.S. recovery has produced 1.4 million new jobs since August 2003, even as another 23,000 telecom jobs have been lost.

As this report shows, conflicting regulatory strategies play a key role in weakening investment incentives throughout the sector. The Telecommunications Act of 1996, which aimed to create new competition and more advanced services, has often hampered that process by crushing market forces with administrative mandates. Specifically, regulators have placed an overreliance on network-sharing regulations by dictating the prices entrants pay to use existing facilities. In turn, regulators have placed entirely too little emphasis on policy measures that would enlist new entry.

The cruel irony is that, despite regulatory impediments, strong alternatives to legacy networks are emerging. Business districts typically host multiple fiber-optic carriers, competing to provide high-capacity voice and data connections. In residential markets, the typical home is potentially served by a phone line, a cable TV line, and multiple mobile phone networks. Six national carriers, and numerous regional players, make wireless service an increasingly competitive option for fixed, as well as mobile, use. Cable television systems, whose lines pass over 96 percent of U.S. households, can also offer head-to-head fixed voice service competition. Indeed, approximately one in seven U.S. homes now chooses between receiving traditional voice service from a phone company or a cable company. Moreover, about nine in ten households can subscribe to a voice over Internet application, using a broadband connection to make voice telephone calls.

With the elimination of regulations that undermine investment incentives, place barriers in the path of consumer-pleasing applications, and dampen innovative efforts by clouding markets with uncertainty over policies, firms would unleash promising twenty-first century networks. In this report, we outline how policymakers can accomplish this and recommend specific policy reforms that will enable market forces to create the competitive telecommunications networks of tomorrow.

The reforms would yield important benefits for the overall economy. First approximation estimates, which include multiplier effects, project an increase in GDP of $167 billion, and more than 212,000 new jobs, over the next five years, in addition to the positive impact of improved telecommunications spending on productivity growth.

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OVERVIEW

Although the telecommunications industry accounts for only 0.9 percent of U.S. employment today, it was responsible for an astonishing 29 percent of net job losses suffered between March 2001 and May 2004. The industry remains mired in depression, even as the U.S. economy now exhibits expansion in virtually every other sector. Overall employment increased by 1.4 million jobs between August 2003 and May 2004; during the same period, telecom employment declined by a further 23,000 jobs.

The magnitude of lost wealth is staggering. From March 2000 to July 2004, the market capitalization of the telecommunications service industry declined by 67 percent, or $760 billion, from $1,135 billion to $375 billion. During the same period, the market capitalization of the equipment makers in the communications technology sector declined 74 percent, or $944 billion, from $1,282 billion to $338 billion.

A healthy telecommunications sector is crucial to U.S. economic growth. The quality of our voice, video, and data services helps drive both productivity gains and the global competitiveness of American business. Although telecommunications made up just 2.9 percent of total GDP as of 2002, communications networks are a key component of the basic infrastructure of our modern economy. Improving investment incentives here would substantially improve growth, employment, and incomes all across the economy.

This study examines how government regulation contributes to the pronounced, long-lived telecommunications slump. The study then recommends reforms to promote the creation of competitive voice, video, and data networks, to encourage new investment, and to speed deployment of innovative technologies. Finally, the study provides estimates of the impact of these reforms on capital formation, employment, productivity, and growth.

TELECOMMUNICATION'S NEW PARADIGM

Historically, American telecommunications markets were tightly regulated monopolies. Regulators not only accepted this outcome as efficient; they actively sought to discourage new challengers. In recent decades this consensus has collapsed. It was proved wrong as competitive, unregulated telecommunications networks pushed past regulatory barriers to produce enormous consumer benefits. In one prominent example, regulators, who originally thought mobile phone service to be a "natural monopoly," licensed the service as a duopoly in the 1980s. The build out of two wireless networks demonstrated that head-to-head competition was viable. The benefits of rivalry then expanded markedly: when the FCC issued several additional wireless licenses in the mid-1990s, per-minute prices plummeted by 80 percent.

The story of mobile telephones is not unique. The price of long-distance phone calls dropped dramatically with the entry of new networks. Video programming jumped in quality, quantity, and variety as satellite rivals began to take market share from cable TV. And residential broadband access is now available to nearly nine in ten U.S. households, thanks to a lightly regulated deployment race between cable modem service and digital subscriber lines. One might argue that competition is, in fact, the new consensus in telecommunications.

U.S. regulators are now struggling with the task of extending these deregulatory successes to the local loop—the "last mile" in telephone networks. The Telecommunications Act of 1996, reversing essential assumptions of the regulated monopoly paradigm of the Communications Act of 1934, instructed state and federal regulators to craft rules promoting last-mile competition. Policymakers have implemented vital reforms. These include elimination of state franchise monopolies for local telephone service and mandatory interconnection among carriers, guaranteeing that subscribers to new phone networks can communicate with customers of rival systems.

REGULATION AS A TAX ON CAPITAL

To further invigorate competition, however, Congress directed regulators to devise network-sharing rules that enable companies to offer local telephone service without building their own networks. Under the resale provisions, entrants could offer retail customers dialtone service delivered entirely over an incumbent phone company's network. With the unbundling provisions, entrants could lease just those parts of the network they needed. A new rival could use the incumbent's local loop and connect last-mile traffic to a switch that it placed in the phone company's central office. In either instance, the Telecommunications Act would allow wholesale access prices to be regulated, a measure that would counter the incumbent's market power.

Congress viewed mandatory network sharing as an insurance policy. Policymakers thought that if natural monopoly would stubbornly continue to prevail in some areas or for some inputs, then competitors should be able to purchase these services at reasonable wholesale prices and provide retail services. Mandatory network sharing would prevent a stalemate in which new networks would be frozen out because of the risk involved in building new systems from scratch. Once new rivals gained substantial market share, the economics of building competing platforms would presumably improve. Soon, consumers would be able to choose among alternative networks. Regulation would fade away, and market competition would rule.

But network-sharing rules have not faded away; rather, they have become embroiled in intense controversy. They have been frequently revised and continuously challenged in legal and regulatory proceedings. After more than eight years of effort, today widespread confusion exists as to their status. This uncertainty has exacerbated the decline in network investment incentives that ensued both from the tightening in credit markets after the bubble in the industry and from the generous terms extended to resellers (i.e., relatively low wholesale prices and extensive resale opportunities).

Dual capital market fiascoes have resulted: investment in competitors' and incumbents' networks has sharply declined; the former because renting was cheaper than building, the latter because property rights to profits flowing from new investments were reassigned to noninvestors. Building large, modern telecom networks involves substantial outlays for "common costs." Regulations governing the use of existing networks are not easily quarantined; new infrastructure investments are inevitably regulated, too.

A policy forcing network owners to lease their assets below rates yielding a market return on investment is essentially a tax on capital. This tax affects capital in two ways. When the tax falls on existing capital (i.e., a network built before the tax was imposed), it reduces the asset's market value. The tax affects new capital by discouraging investors from creating additional network assets and from spending to maintain existing assets. As a result, telecom networks suffer from aging and increased obsolescence, similar to the deterioration of the housing stock following rent controls.

Both factors interacted with financial market pressures to exacerbate the implosion of telecom capital spending in recent years. Annual capital spending in all areas of telecommunications plummeted from a peak of $132 billion in 2000 to just $56 billion in 2003. The loss of capital spending due to regulation is estimated to be more than $20 billion for incumbent operators and an additional $2 billion to $3.5 billion for competitive entrants. As we outline below, this forgone capital investment substantially reduces output, employment, productivity, and competitiveness for the overall economy.

PRICE DISTORTIONS AND DECLINING INVESTMENT

Much of the blame for this drastic pull-back by telecom investors lies at the feet of an ill-fitting, contradictory regulatory structure. Two policy conundrums stand out. The first is that, for fixed-line phone service, the government regulates both retail and wholesale rates, and the regimes sharply conflict. Retail rates are set such that everyone in a given state pays about the same, *without regard to cost.* This means that high-cost customers (such as Aspen, Colorado, millionaires) pay what low-cost customers (such as blue-collar apartment dwellers in Denver) pay. Overall, business and long-distance charges have been kept artificially high to pay for lower prices for residential local access, a cross-subsidy that, according to its proponents, advances "universal service."

Juxtaposed to the retail rate regulation and universal service polices are regulations that mandate wholesale access to networks be priced *on the basis of cost*. The focus on costs in the wholesale market is an attempt to send the correct economic signals to entrants so that they build networks only when they can do so more efficiently than incumbents. Combined with retail price regulation, this policy fails because entrants leasing existing facilities will be drawn to markets where regulated prices are kept artificially high rather than to those where the new rivals most efficiently satisfy consumer demand. In fact, new local competition has been relatively robust in business services, which regulators intentionally price above cost. By December 2003, new rivals provided approximately 25 percent of local business phone service, as against 14 percent of the residential and small business market.

Entrants naturally seek to capture profits offered by regulatory pricing distortions, but this diverts the productive efficiencies market rivalry delivers. One excellent solution would be to rationalize retail pricing by charging consumers for the costs they generate. Many rural customers could see bills go higher, while the great majority of customers—urban and suburban households and businesses virtually anywhere—would see total phone charges fall. Yet rural customers need not suffer, because billions of dollars in subsidies—today largely wasted—could compensate for expected price increases. Moreover, the subsidy could be raised and distributed more efficiently. The social payoff would be enormous: better, more competitive phone services.

The second intrinsic regulatory contradiction involves discrimination against investors who create new phone networks. To encourage construction of competing systems, some regulations can be effective, including mandatory interconnection. But expanding wholesale access by mandating large discounts kills the investment incentives of incumbents, just as a price control generally deters investment. Those regulations also undermine the creation of competitive networks, because deeply discounted wholesale access to existing networks allows resellers to take market share from facilities-based entrants. Even the threat of inexpensive resale can deter the risk capital needed to build a new network to compete with existing systems.

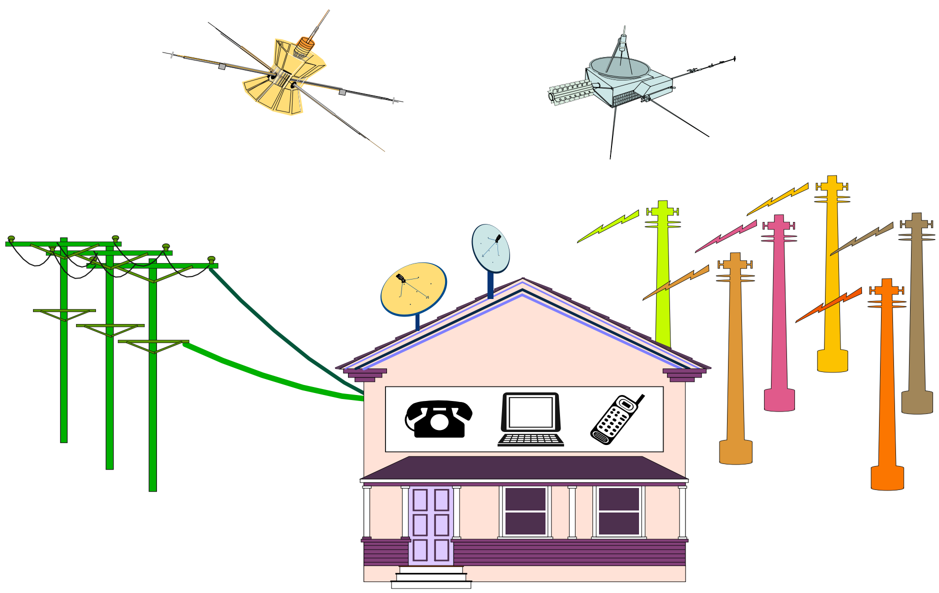
Market data support this view. With the sharp decline of wholesale access prices (set by regulators) over the past five years, the number of resold lines has exploded. Concomitantly, the growth of facilities-based competitive lines has collapsed. And capital expenditures for networks have imploded, despite strong demand for broadband services. Incumbents and competitors have failed to attract capital to build bigger and better networks, and those firms large enough to generate their own capital are using the money for other things—for instance, to build wireless networks, to pay dividends to shareholders, or to reduce debt.

RIVAL NETWORKS ARE AVAILABLE

The economic tragedy is that the regulatory stalemate occurs just as many networks are ready and able to offer competitive phone, video, and Internet access services. Business markets demonstrate that, with heavy demand and dense usage, competitive rivals can build alternative platforms for voice and data. Even in residential markets, rival telecommunications pathways are visible. Incumbent phone companies no longer own the sole communications path to the customer's premises. A potentially competitive—*highly competitive*—marketplace is already on the horizon.

There are about 109 million U.S. households. The typical residence receives service from a telephone line provided by an incumbent local exchange carrier (ILEC)—a Baby Bell (BellSouth, SBC, Qwest, or Verizon) or an independent (such as Broadwing or SureWest). About 15 million households and businesses getting this ILEC service receive bills from a reseller, not the ILEC. Virtually all the intense regulatory, legal, and political skirmishing—what analysts call the telecom UNE-P (unbundled network element-platform) roller coaster—has been devoted to setting the terms of this network-sharing scheme. Fortunately, however, multiple networks are now emerging to offer popular service substitutes. These include cable, wireless, and satellite platforms, as well as new applications creating virtual networks, such as voice over Internet protocol (VoIP). Figure 1 depicts these competing technologies.

Figure 1. Competitive Telecommunications Pathways to the U.S. Household



Cable

The typical house is passed by a high-capacity communications conduit owned by the local cable TV system, providing analog video, digital video, video on demand, and high-speed Internet access. Note the discrepancy in coverage:

- Cable operators offer phone service to 16 million households—of which about 2.5 million subscribe.
- Cable operators offer broadband service to approximately 97 million households—of which about 15 million subscribe.

Cable systems could add phone service with incremental investments. Yet incentives to offer telephony have proven relatively weak. This is not surprising, given the threat resellers pose by using the incumbent carrier's network at politically determined rates. A cable company anticipating revenues per subscriber of $50 a month from local and long-distance telephone subscriptions may well be deterred when rivals reselling the incumbent telephone company's service may offer similar services for $40, depending on where regulators decide to fix wholesale prices. This cloud shadows a potential cable entrant's investment in telephony much as it does an ILEC's, the difference being that the newcomer avoids appropriation by simply declining to invest. Fortunately, cost and functionality advantages now presented by maturing voice over Internet technologies are large and thus are pushing major cable operators to deploy some brand of voice service to customers.

Wireless

Competitive pathways multiply with wireless technologies. Six national networks now serve the U.S. market, and consumer demand for mobility is making wireless an archrival of landline phone systems. Wireless service has already replaced about 43 percent of long-distance calls. By 2005, the United States will probably have more wireless than fixed-line subscribers; the global switchover occurred in 2001. In developing countries, wireless is now the technology of choice for new construction. In developed countries, wireless substitution is eliminating large numbers of wired connections altogether.

Satellite

While analyses of local telephone policy have often overlooked satellite communications, satellite platforms can form key elements in a more competitive marketplace. While standard phone calls suffer quality handicaps when transmitted via traditional satellite connections, direct broadcast satellite (DBS) systems have proven effective in delivering multichannel video, competing with cable TV operators. This has prompted cable operators to upgrade their systems for digital services and has helped to ignite deployment of cable modem service. In turn, phone companies have had to respond with investments in digital subscriber lines (DSL), broadband links supplied via phone lines. With VoIP technology turning broadband connections into phone lines, local loop competition is at hand. Cable's introduction of "triple play" offerings—voice, video, and high-speed data—in discounted bundles has pushed satellite and telephone companies to form alliances, bundling telephone company voice and DSL service with DBS video.

Emerging Technologies

Other promising technologies and applications appear ready to challenge the status quo. Electric power networks offer an additional distribution grid capable of transporting large quantities of data, delivering voice and video, to homes and offices. Terrestrially based fixed wireless technologies can provide additional communications links. DBS operators have begun delivering high-speed Internet access.

With the ripe opportunities for competitive network development, ambitious network-sharing mandates have proven a costly distraction. Complex to evaluate, difficult to craft, and contentious to enforce, these arranged marriages dictate that a network host its rival on terms established by administrators. To enforce cooperation among parties with diametrically opposite interests, regulators predictably impose more and more comprehensive regulations. Rulemakings are stacked upon rulemakings, followed by complaints, petitions for reconsideration, litigation, appeals, and appeals of the appeals. Uncertainty is rampant as regulators and courts declare, amend, overrule, and then reconstitute various rules. Risk increases, and capital investment is deterred. This has important effects on the overall economy by reducing output, employment, and productivity. Lawyers and lobbyists profit—while consumers wonder what happened to the advanced networks and innovative services "deregulation" was supposed to bring.

Given the observed effects of this approach and the demonstrated availability of competitive networks, policymakers now have a golden opportunity to reform telecommunications rules by substituting market forces for regulation. In this report, we describe the internal contradictions in the existing regulations and recommend an exit strategy. These policies will generate economically productive investment, produce efficient, price-lowering competition, and stimulate innovation in advanced telecommunications services. Recommended reforms, which require regulatory or legislative action at either the state or federal level to achieve, fall into two categories: ending policies that discriminate among networks and ending price distortions in telecommunications markets.

Ending Policies That Favor One Network over Another

This category of reforms entails four measures:

1. Phasing out wholesale access based on *theoretical* costs in favor of the basic price-setting mechanism now used for total service resale and sunsetting such price controls (perhaps after three to five years).

2. Expeditiously making at least 438 MHz of additional prime radio spectrum available for flexible use by competitive wireless licensees.

3. Declaring both cable modem and digital subscriber line services to be information services, which are not subject to common carrier regulatory obligations, and preempting state regulation of these services under the guise of "open access."

4. Extending the FCC declaration of Internet-only VoIP as "information services" not subject to regulation to all VoIP services and preempting Internet phone service from state regulation, specifically leaving quality of service unregulated.

Ending Price Distortions

This category of reforms entails two additional measures:

1. Raising funds for universal service in a competitively neutral manner. Funds should be appropriated from general revenues or be generated via a relatively nondistortionary telecommunications tax, for example, a fixed monthly fee levied on each telephone number.

2. Distributing universal service funds via consumer vouchers, not with payments to telephone companies, to allow competition among suppliers and choice for customers.

This reform package would benefit virtually all telephone users and produce enormous economic gains. Not only would social goals such as universal service continue to be met, but competition-enhanced efficiency would markedly increase the productive use of telecommunications networks. Competitors would shift unproductive investments in regulatory process toward efficient investments in new networks and innovative applications. The sector—now heavily taxed—would be unburdened. U.S. businesses would witness dramatic cost savings, as artificially high business phone rates would fall. Consumers would gain from these efficiencies, as well as from lower prices and myriad innovations in residential market telecom services.

Increased Capital Spending Stimulates Job Creation and Growth

Reforming telecom policies would lead to dramatic increases in capital spending, output, and employment in the sector. On the basis of our estimates, the changes outlined above could generate a total of $58 billion in incremental capital spending on network assets over the next five years by incumbent local exchange carriers, facility-based competitive local exchange carriers, wireless companies, and cable operators.

Increases in capital spending also lead to increases in output and employment in other industries—the multiplier effect described in macroeconomics textbooks. Standard Bureau of Economic Analysis multipliers, for example, suggest that each additional $1 of telecom capital spending leads to $2.86 in extra output, while every $1 million rise in telecom capital spending leads to 18.2 new jobs. On the basis of our estimates, the proposed reforms would add $167 billion to output and would increase average employment levels by more than 212,000 jobs over the next five years.

Lower Prices Benefit Consumers and Businesses

Less direct, but no less real, are the effects of enhanced communications networks and lower prices for telecom services on the productivity, employment, costs, profits, and market values of the businesses that use information services as inputs in producing nontelecom outputs. Our proposed increase in available radio spectrum, for example, would lead to a reduction in wireless prices of approximately 50 percent, allowing users to increase their use of wireless minutes by 95 percent. By the end of the forecast period, annual increases in consumer surplus would exceed $77 billion; nontelecom businesses would see costs fall and profits increase.

DEREGULATION IMPROVES PRODUCTIVITY

The most powerful impact of the proposed telecom reforms will most likely occur indirectly through the enhanced productivity and competitiveness of American workers and companies. Reforming regulations to encourage investment in new high-speed networks will both reduce costs and improve service quality for U.S.-based companies. This factor-substitution effect would be especially important in professional services, technology, healthcare, education, and other knowledge-based industries, which increasingly drive U.S. growth and which will constitute the battleground in global outsourcing for years to come.

A consensus has emerged among economists that information technology investments have been the principal drivers behind the extraordinary doubling of productivity growth of U.S. workers since 1995 and that advances in information and communications technology may account for as much as three-fourths of overall labor productivity growth since 1995. High-speed communications systems have helped corporations pursue the restructuring activities known variously as reengineering, demand-flow manufacturing, lean manufacturing, speed-to-market, or cycle-time reduction. These strategies show up as reduced inventories, lower working capital, improved product quality, and increased output per hour of work—the key drivers of long-run increases in living standards.

Investment in high-speed telecom networks and other information technology capital may be responsible for nearly one full percentage point of the annual increase in U.S. productivity since 1995. Yet, the telecom-driven productivity boom has mainly been restricted to large companies and urban areas that have access to high-speed telecom networks. The capital spending that would likely take place with our proposed regulatory reforms would bring the advantages of high-speed telecom networks to small companies in towns across the country, which produce more than half of GDP and account for 75 percent of job creation, would generate a second wave of productivity growth of as much as 0.25 percent per year. At current GDP levels, this productivity boost would add $93 billion per year to GDP, or a total of $467 billion in additional goods and services over the next five years.

The total impact of the telecom reforms recommended in this report is the sum of the demand impact of increased capital spending on network assets plus the supply impact of increased productivity growth. Together, our estimates suggest that telecom reforms have the potential to increase average annual GDP by $127 billion per year over the next five years by adding $634 billion in additional goods and services and increasing average employment levels by over 212,000 jobs over the same period.

SUMMARY

We describe the state of the telecommunications industry and the current regulatory environment. We outline a set of regulatory reforms that would invigorate the sector and deliver large benefits to consumers, workers, and businesses throughout the U.S. economy. They are summarized in Table 1.

Table 1. Recommended Regulatory Reforms

1. Phase out mandatory network-sharing rules and, more immediately, end regulated wholesale rates set at theoretical costs.
2. Make 438 MHz of prime radio spectrum available for commercial wireless operators.
3. Exempt high-speed cable modem and digital subscriber lines from common carrier regulations.
4. Make Internet services not subject to state phone service regulations.
5. Raise funds for universal service directly from general tax revenues, rather than from hidden costs that penalize telecommunications competition and the growth of network services.
6. Distribute universal service funds directly to targeted consumers.

We also create rough empirical estimates of the magnitude of the benefits that would follow such deregulatory reforms. See Table 2.

Table 2. Point Estimates of Economic Impacts from Proposed Regulatory Reforms

1. $58 billion in new capital investment over five years.
2. Investment-led increases in economic growth that result in GDP increases of $167 billion over five years.
3. Increased productivity, adding an additional $467 billion to GDP.
4. A combined effect of both supply and demand channels totaling $634 billion of additional goods and services, including $113 billion in new tax revenues over five years.
5. An increase in average employment levels by more than 212,000 jobs.
6. Added consumer value from price competition and innovative new services.
7. Enhanced U.S. competitiveness in the global marketplace.
8. Accelerated rollout of new technologies and advanced networks in knowledge-based industries and applications.
9. Achievement of social goals such as universal service.

No change is easy to make. It will take forceful action by policymakers to effect these reforms. Each year of delay will cost the U.S. economy about $12 billion of investment spending and about $33 billion of GDP and will deter the creation of more than 212,000 jobs.

I
INTRODUCTION

Telecommunications regulation has experienced a paradigm shift. Where policymakers had long viewed networks as natural monopolies requiring heavy government oversight, new technologies emerged in competitive environments. When regulators first considered cellular systems, for example, they assumed that monopoly was efficient. The eventual license allocation provided for a duopoly, which later—when licenses for personal communications services (PCS) were issued—gave way to the establishment of six national networks. Today mobile phone service is the "poster child for market competition." The Telecommunications Act of 1996 aimed to advance this new reality to the core of the industry: local telephony. The act abolished state phone monopolies and directed existing networks to accept the traffic upstarts created. To guarantee that competing networks could offer "last mile" rivalry, network-sharing rules allowed entrants to use incumbents' facilities. After eight years, however, these rules are in disarray. Fortunately, emerging networks allow markets to replace government regulators and thus extend the new competitive paradigm.

The idea that competitive market forces prove superior to government regulation is a compelling one. Yet, in telecommunications, a counterclaim has long held sway: that network technologies work best when monopolies regulated by government provide essential services. Important economies of scale and key social policies are implicated, and many analysts have argued that unregulated markets present special problems in the sector. Hence, the quandary: Should policymakers welcome innovative rivals? Or should communications systems operate on terms devised by regulators?

THE DEATH OF "NATURAL MONOPOLY" AND THE BIRTH OF MULTIPLE NETWORKS

The conflicting visions clashed in the wireless market. The Federal Communications Commission (FCC), sympathetic to the "natural monopoly" argument, found in 1974 that "competing cellular systems would not be feasible" and that only existing phone carriers had the ability to provide new wireless networks. Hence, the commission determined that each cellular license would go to an existing (wireline) monopoly phone franchisee, one per market.[1]

Yet, the following year, the FCC modified its policy and authorized nonwireline carriers to apply for the cellular licenses issued one per market.[2] Still, the debate continued. Finally, in 1981, the FCC threw caution to the wind and authorized a second

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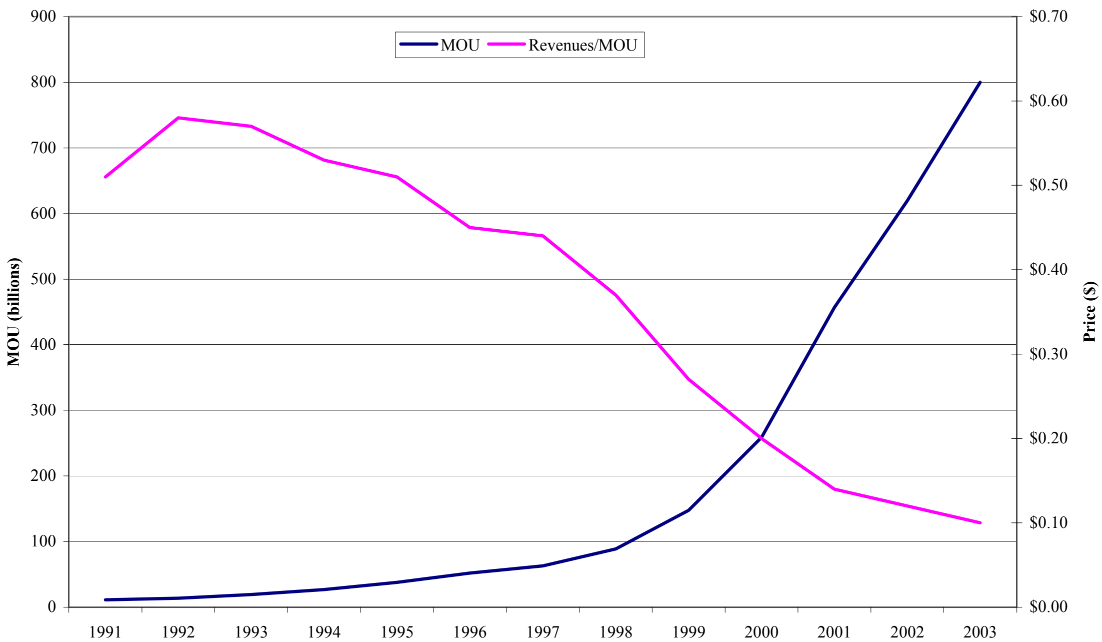
1 Federal Communications Commission, *An Inquiry Relative to the Future Use of the Frequency Band 806–960 MHz, Second Report and Order,* 46 F.C.C. 2d 752, 760 ¶ 21 (1974).

2 Federal Communications Commission, *An Inquiry Relative to the Future Use of the Frequency Band 806–960 MHz, Memorandum Opinion and Order,* 51 F.C.C. 2d 945, 946 ¶4, 953–54 ¶¶30–32 (1975).

cellular license in each of 734 U.S. markets.[3] The commission issued permits, most via lotteries, in 1984–1989.

Figure I-A. U.S. Wireless Prices and Minutes of Use: 1991–2003



Source: Cellular Telecommunications & Internet Association, *Wireless Industry Indices Semiannual Data Survey Results* (Aug. 2002); http://www.ctia.org/public_policy/statistics/index.cfm/AID/10030.

It is difficult to remember how sharp a deviation from orthodoxy this was. Two decades later we can see what regulators could then only ponder: multiple networks are efficient. In 1995–1996, the FCC awarded six new licenses for personal communications services in each market. Firms invested tens of billions of dollars in new platforms to challenge the erstwhile cellular duopoly. Rather than succumb to the advantages enjoyed by incumbent wireless licensees, half of which were subsidiaries of local (fixed-line) phone carriers with which PCS entrants had to interconnect, the new networks prospered—and forced the incumbents to slash prices and improve service. In December 1995, the average price per minute of use (MOU) in wireless was 50¢; by December 2003, it had fallen to just 10¢.[4] (See Figure I-A.) By then, six national wireless networks had emerged (AT&T Wireless, Cingular, Nextel, Sprint PCS, T-Mobile, and Verizon Wireless) as well as several regional networks (e.g., U.S. Cellular and Alltel) and a number of resellers (e.g., Virgin and TracFone). In three decades the conventional wisdom has flipped: what in 1974 appeared a natural monopoly looked—in 2002—in FCC Chairman Michael Powell's words, to be "the poster child for market competition."[5]

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3 Federal Communications Commission, *Cellular Report and Order*, 86 F.C.C. 2d 476 ¶ 15; 482–83 ¶¶ 27–29 (1981).

4 Cellular Telecommunications and Internet Association data (May 2004); http://www.ctia.org.

5 Michael Powell, Dialogue with Thomas Wheeler, President, Cellular Telecommunications and Internet Association, at the National Association of Cellular Telecommunications and Internet Association, Orlando, Florida (Mar. 19, 2002).

Conventional wisdom was being revised elsewhere. The Ford Administration filed the famous antitrust suit, *U.S. v. AT&T*, in November 1974, at a time when one company essentially controlled local and long-distance telephone service, as well as telephone equipment manufacturing and research and development, in the United States. That suit ended on January 8, 1982, when AT&T agreed to divest its local telephone exchanges on January 1, 1984. By then, the emergence of rival long-distance networks was well underway. Telephone equipment markets, opened to competition with FCC mandates for "plug 'n play" interfaces in the 1970s, were already flooded with competitive choices. Data traffic was exploding in volume, and soon—following the personal computer revolution—mass-market e-commerce would arrive and bring with it thousands of online competitors.

In parallel developments, new wireline systems were created to deliver video service to households desiring alternatives to over-the-air broadcasting. Federal policies resisted the foray and protected TV stations until the deregulation wave of the late 1970s. Cable TV operators then wired the country for multichannel video. By 1988, more than one-half of U.S. households subscribed, up from only 9 percent of households in 1972.[6] Cable's success provoked a competitive response of its own; national satellite TV platforms were launched in 1994 (DirecTV) and 1996 (EchoStar). By the mid-1990s, the notion that CBS, ABC, and NBC formed a tightly knit oligopoly appeared quaint.

THE TELECOMMUNICATIONS ACT OF 1996

About to enter was the Telecommunications Act of 1996, a sweeping revision of the Communications Act of 1934. The past era's formative assumption was that monopolies would deliver efficient network technology, while administrative controls would discipline operators' rates. At that time, policymakers also assumed that without strict regulation firms would underprovide such desirable social goods as universal service, an affordable telephone connection to everyone in the nation.

But the power of those assumptions faded with time. The marketplace success of multiple network rivals across the telecommunications landscape—in wireless communications, consumer equipment, long-distance service, and television—demonstrated that consumers benefited when markets were open to new rivals. Monopoly platforms were not, it seemed, all they were cracked up to be.

In 1996, bipartisan agreement was reached that it was time to revise assumptions; the result, the Telecommunications Act of 1996, emerged. Indiana University law professor Michael Meyerson described the legislation in terms of competition and technological innovation:

> This law represents a vision of a telecommunications marketplace where the flexibility and innovation of competition replaces the heavy hand of

[6] Dominic Toto, U.S. Bureau of the Census, *Job Growth in Television: Cable versus Broadcast, 1958–99*, MONTHLY LAB. REV. (Aug. 2000), at Table 5; http://www.census.gov/population/socdemo/hh-fam/tabHH-1.pdf.

> regulation. It is based on the premise that technological changes will permit a flourishing of telecommunications carriers, engaged in head-to-head competition, resulting in a multitude of communications carriers and programmers being made available to the American consumer.[7]

This legislation was the logical progress of a long march. Where the 1950s had seen an end-to-end telephone monopoly oppose use of any "foreign" equipment (equipment not manufactured by the Bell System's Western Electric company), including the "Hush-A-Phone" attachment (a rubber cup[8] that fastened onto a handset and allowed a caller to speak without being heard by someone nearby), micromanaged markets ultimately proved deficient. In 1996, University of California economist Joseph Farrell, then the FCC's chief economist, explained:

> [T]elephone regulation, like the tax code, has grown unwieldy, unmanageable, inefficient and dysfunctional. It's time to find an alternative. Competition is the greatest technique ever invented to bring about innovation, low prices, choice, and efficiency. If we can efficiently create competition in this so-called natural monopoly, we'll have done a great thing.[9]

LAST-MILE COMPETITION

The central feature of the Telecommunications Act of 1996 was the policy to promote competition in the "last mile." This is the point at which users connect to phone networks; once on the network, communications go wherever the interconnections link. In the well-traveled backbones of this communications grid, alternative pathways traverse long distances. But at the homes and small offices where most users first connect, links are less traveled. Monopoly was thought "natural." The Telecommunications Act decreed that it was not.

But Congress did not propose unregulated competition. To help new competitors start up, the act imposed network-sharing rules that allowed entrants to piggyback on incumbents' connections and resell service. A competitor could provide service either with a "total service resale" (TSR) package, with the competitor retailing phone service delivered entirely over the incumbent's network, or the entrant could use just part of the existing network. This latter approach, called unbundling, gives rivals access to segments of the incumbent local exchange carrier (ILEC) facilities such as the local loop that wires end-users into the network.

The Telecommunications Act was designed to jump-start competition. Mandatory network sharing would be a "stepping stone" that would provide capital so

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7 Michael Meyerson, *Ideas of the Marketplace: A Guide to the 1996 Telecommunications Act*, 49 FED. COMM. L. J. 252 (Mar. 1997); http://www.law.indiana.edu/fclj/pubs/v49/no2/ meyerson.html.

8 Joseph Farrell, *Creating Local Competition*, 49 FED. COMM. L.J. 201 (Nov. 1996); http://www.law.indiana. edu/fclj/pubs/v49/no1/farrell.html.

9 *Id.*

that rivals could eventually build their own networks. With multiple choices then confronting consumers, regulation would become superfluous.

The act provided that state regulatory commissions would set wholesale pricing and access rules by using specific guidelines established by the FCC. The act called for this regulation because rules giving new rivals the right to share existing networks would be rendered moot if the incumbents themselves set prices or other terms of use so as to discourage all new entry. Rate regulation was to establish reasonable prices for wholesale network access—"wholesale" because new service suppliers were using existing facilities to compete for "retail" customers.

The two resale approaches have distinct rate-setting regimes. TSR prices are determined based on the regulated retail price of service minus the avoided costs of the incumbent carrier (cost savings from having another firm provide marketing and customer service). Set in the late 1990s, these generally yield entrants discounts (from retail prices) of 15–25 percent.[10]

Access to unbundled network parts involves more complex rules. First, regulators must decide which pieces of the network are to be offered separately; these are called unbundled network elements, or UNEs. They include the local loop, switching, and transport (taking traffic from the phone company central office to distant destinations or other networks).

Then, regulators must set wholesale prices for each UNE. The framework adopted by the FCC uses the theoretical costs of an ideally efficient new network, a model known as TELRIC (total element long-run incremental cost).[11] Because existing networks are built with older technology and may not be optimally configured, given changing demand and supply conditions (or deployment inefficiencies), wholesale prices are set below an incumbent's actual costs under TELRIC rates.

While the original idea of unbundling was that the entrant would want to purchase access to elements of the incumbent's network—e.g., local loops—to combine with other elements it would provide—e.g., switching and transport to distant nodes—regulators developed a package that offered all unbundled network elements in a new bottom-up resale program called UNE-P (unbundled network elements-platform). This package was

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[10] *How Much Pain from UNE-P?* UBS WARBURG (Aug. 20, 2002), at 6.

[11] Alfred E. Kahn, who has long analyzed the regulation of U.S. public utilities, underscores the key point in his colorful depiction of the rule as "TELRIC-BS." The appended acronym is said to stand for "blank slate," which captures perhaps the key pricing element: costs are determined by regulators to be what a most efficient network would incur if built today. Since prices are periodically reset and costs, driven by technological advance, tend to fall over time in telecommunications networks, network owners will predictably recoup less than the costs they incur when the facilities they create are rented in future periods. Alfred E. Kahn, *Letting Go: Deregulating the Process of Deregulation or Temptation of the Kleptocrats and the Political Economy of Regulatory Disingenuousness*, Institute of Public Utilities and Network Industries (Michigan State University, 1998). See also Robert S. Pindyck, *Mandatory Unbundling and Irreversible Investment in Telecom Networks,* NATIONAL BUREAU OF ECONOMIC RESEARCH WORKING PAPER w10287 (Feb. 2004).

similar to TSR but was priced much lower. Equity analysts estimate that the average retail discount for wholesale access is about 50 percent—at least twice as large as under the TSR approach.[12]

Cornell University economist Alfred E. Kahn notes that UNE-P is an oxymoron, because the platform is the *reassembly* of the parts of the network that regulators *disassembled* (unbundled) to assist competitive entry.[13] After UNE-P started becoming available at relatively low TELRIC prices in 1999–2000, this category of competitive lines grew very rapidly relative to others. By 2004, market analysts estimated that the United States had about 29 million competitive local exchange carrier (CLEC) lines (compared with about 152 million ILEC lines),[14] of which:

- about 16 million were UNE-P;
- about 2 million were TSR;
- about 7 million were provided over competitive networks, including approximately 3 million cable telephone lines; and
- about 4 million used ILEC local loops but otherwise the facilities (switches, transport, etc.) of the CLEC, an approach called UNE-L.[15]

PITFALLS OF SHARING MANDATES

Hence, as UNE-P lines have increased rapidly in recent years (going from virtually zero in 1999[16] to now accounting for more entry than all other competitive lines combined), facilities-based entry has flattened. In econometric tests, the level of UNE-P subscribership in one period does not help predict the level of facilities-based competitive subscribership in the next period (or the following one). Rather than provide a stepping stone to new entry, the UNE-P regulatory offering appears to crowd out new networks. In particular, cable telephony—available to virtually any U.S. household with only modest incremental investment—is stymied. While cable operators invest aggressively to upgrade systems for digital cable and now offer high-speed Internet access to about 90 percent of U.S. households, they have generally refrained from building out phone service, which is available to only about 15 percent of homes. See Table I-A.[17]

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12 *The Far-Reaching Impact of UNE-P Regulation,* MOODY'S INVESTORS SERVICE (Oct. 2003), at 5.

13 ALFRED E. KAHN, LESSONS FROM DEREGULATION: TELECOMMUNICATIONS AND AIRLINES AFTER THE CRUNCH (AEI-Brookings Joint Center for Regulatory Studies, 2004), at 23.

14 Federal Communications Commission, *Federal Communications Commission Releases Data on Local Telephone Competition* (June 18, 2004); http://www.fcc.gov/Bureaus /Common_Carrier/Reports/FCC-State_Link/IAD/lcom0604.pdf.

15 Patrick Brogan and Scott Cleland, *Facilities-Based CLECs Benefit from Migration away from UNE-P,* PRECURSOR BULL. (July 7, 2004).

16 Federal Communications Commission, Wireline Competition Bureau, Industry Analysis and Technology Division, *Trends in Telephone Service* (May 2004), at Table 8.4; www.fcc.gov/wcb/stats.

17 FCC data for year-end 2003 set cable telephony subscribership at 3.2 million lines. This implies that each subscribing household takes about 1.33 lines.

Table I-A. Broadband and Telephone Subscribers for Top Ten Cable TV Operators (Year-End 2003)

Service	Passings	Subscribers	Availability	Penetration	Net Adds (2003)	Net Adds (2002)
Broadband	96,750,000	15,338,000	91%	15.9%	4,486,000	4,217,000
Telephony	16,400,000	2,375,000	15%	14.5%	156,000	685,000

Source: Leichtman Research Group, *Research Notes* (First Quarter 2004).

Moreover, the rule-setting process has proven extremely quarrelsome, with substantial public and private resources diverted from productive enterprise. Says one analyst: "You have a total Hatfield and McCoy feud. This is an eight-year, claw-your-opponent's-eyes-out battle regulatorily, legally, and politically. If they could have settled this, they would have, a long time ago."[18]

The result of the contentiousness is that the status of UNE-P is now very much in doubt. In the eight years following the Telecommunications Act of 1996, there have been several attempts to create UNE rules and a large number of federal and state regulatory proceedings addressing UNEs. Yet, as of mid-2004 no "controlling legal authority" prescribes the terms on which an incumbent carrier must rent its network to rivals.

Wharton professor and former FCC chief economist Gerald R. Faulhaber notes, "The extensive regulatory proceedings and court challenges of the outcomes has demonstrated that the market boundary Congress sought to define in the Telecommunications Act is anything but simple, involving such complex transactions costs as to be virtually unregulable."[19] Even if local exchange carriers were to wholly divest operations outside their (regulated) local loop facilities, he contends, "the hope that competition would arrive in the local loop market on the wings of unbundling seems optimistic in the extreme."[20]

Reviewing successful competitive episodes in numerous telecommunications markets, Faulhaber finds that "successful entry usually occurs with a new business model and often a new technology. Such 'category killers' break the mold of incumbents, bringing new features and functions to customers, perhaps from related markets. Fortunately, there are several likely candidates for 'category killers' in telephony."[21]

Underpricing access to existing facilities *raises* the relative cost of new facilities and signals the market to embrace resale over *efficient* investment in new "category killers." This, in turn, undermines the transition to facilities-based competition and locks in extensive, costly regulation, for the simple reason that the success of rival telecommunications companies is now highly dependent on how regulators set terms and conditions. This was exactly the result to be avoided, according to Stanford University economists Gregory L. Rosston and Roger G. Noll. In commenting on the Supreme

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18 Ellen Simon, *Phone Competition Dials up a Battle Royal*, WASH. POST (May 2004).

19 Gerald R. Faulhaber, *Policy-Induced Competition: The Telecommunications Experiments*, 15 INFO. ECON. & POL'Y 73 (2003), at 92.

20 *Id.* at 93.

21 *Id.*

Court's May 2002 decision[22] to uphold the use of theoretical costs (TELRIC) when pricing wholesale access, they wrote:

> [T]he decision permits a test of whether the stepping-stone theory of local access entry is valid. While the outcome of this experiment is uncertain, two possible outcomes are likely to be good for consumers. One is that facilities-based competition in wire-line access, with entrants eventually providing switching and other intelligent network functions, emerges from UNE-based entrants. The second is that wireless services make local telephone access competitive even if wire-line competition remains very limited. In either case, local access regulation can be replaced by competition.
>
> The third possible outcome is that when the dust settles, most local access competition will take the form [of] resale of the incumbent's facilities. In this case, consumers are not likely to benefit, and regulation will, if anything, grow as regulators are called upon to resolve disputes between incumbents and resellers.[23]

The results of the test Rosston and Noll described are now observable: UNE-P growth does not appear to be associated with increased investment in incumbent or competitive networks.

NEW FORMS OF COMPETITION

The network-sharing regulatory strategy, designed to spur competition, conflicts with the aim of establishing new networks, and in many telecom sectors where network-sharing polices do not exist, competition flourishes. Take wireless. Six national wireless telephone networks, now serving over 164 million subscribers, are becoming an excellent alternative to fixed-line service. A substantial portion of long-distance traffic in the United States has already migrated. It is estimated that about 5 percent of the approximately 109 million U.S. households have disconnected their traditional phone service altogether and rely solely on their mobile phones.[24] Another 6 million households are predicted to do so over the next two years.[25] Industry experts believe that ILECs will continue to see revenue losses directly attributable to wireless substitution.

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22 *Verizon Communications v. FCC*, 122 S. Ct. 1646 (2002).

23 Gregory L. Rosston and Roger G. Noll, *The Economics of the Supreme Court's Decision on Forward-Looking Costs,* REV. NETWORK ECON. 81 (Sept. 2002), at 88–89.

24 SBC, *The Status of Competition in Ohio* (May 2004), at 5. See also Scott Ellison, *Wireless Displacement of Wireline Access Lines Forecast and Analysis*, *2003–2007*, IDC (Aug. 2003), at 16. FCC data also reveal that the total number of fixed lines in the United States declined by 10 million between December 2000 and June 2003, although some substitution is accounted for broadband. Ben Charny, *The Price of VoIP's Thriftiness,* CNET NEWS.COM (July 19, 2004); http://news.com.com/2100-7352-5273275.html.

25 *Fixed Minutes Go Mobile—But Don't Cut the Cord*, TELECOMASIA.NET (June 1, 2004); http://www.telecomasia.net/telecomasia/article/articleDetail.jsp?id=97278 (citing report by Advanis).

Because of the high value consumers attach to mobility, as well as differing supply side characteristics, wireless networks appear to have been little deterred by fixed-line network-sharing rules. Cable telephony is another story. As noted, cable TV operators currently provide about 3.2 million local telephone lines (to about 2.4 million households). These are largely supplied via standard telephone wires run to customers' homes alongside coaxial cables delivering video service. Recently, increased efficiencies became possible via the maturation of voice over Internet protocol (VoIP) technology, which enables voice calls to be carried over cable modems with a relatively small additional capital outlay. Yet, widespread regulatory uncertainty exists as to how the government will tax and regulate VoIP, and some operators and investors are waiting to see how these decisions are made before aggressively moving to mass-market deployment. Moreover, pricing distortions (with regulated wholesale prices in the competitive medium) may become even more important as new cable-telephone strategies are weighed:

> The crux of the problem for cable is this. Thanks to UNE-P regulations and the entrance of U.S. long-distance companies into local telephony, lifeline plain old telephone service (POTS) is already a commodity. And at the other end of the spectrum, the advanced calling features and mobility options offered by Session Initiation Protocol (SIP) players like Vonage blow POTS out of the water for early adopters. PacketCable 1.x implementations fall between these two categories. They usually do not match the reliability of POTS, or even the pricing anymore. Nor do they match the features of IP [Internet protocol] pure-plays like Vonage. In other words, in IP telephony, PacketCable 1.x essentially offers consumers the worst of both worlds.
>
> On the UNE-P side, major [long-distance operators] like AT&T, Sprint, and MCI are now all selling their own unlimited local and long-distance consumer POTS service bundles for under $50 a month (taxes excluded). These plans, like AT&T One Rate USA, The Neighborhood by MCI and Sprint Complete Sense, often include value-added features like voicemail, caller ID, call waiting and three-way calling. For the low end of the market, they offer even simpler bundles for under $30 per month. One has to wonder: Why would most mainstream consumers risk going to cable IP phone service when they can switch to AT&T for a package that is cost-comparable?[26]

While the development of wireless networks may not suffer the same disincentives as those driven by UNE-P, regulatory constraints are tight and counterproductive for another reason: spectrum scarcity. If more bandwidth were made available for licensees, wireless phone service would cost even less, and operators would offer much more competitive data service, including broadband Internet access. Yet, virtually alone among advanced industrial economies, the U.S. government allocation for

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[26] Michael Harris, *Cable's IP Telephony Conundrum*: *The Industry's Postponed PacketCable 1.x Push May Prove Too Little, Too Late,* CABLE DATACOM NEWS (Apr. 2004); www.cabledatacomnews.com.

mobile phone licensees is under 200 MHz—about the bandwidth that would be expected of a country like Peru with average per capita income of approximately $5,000 per year. By contrast, members of the European Union average between 250 and 300 MHz. Germany allocates 302 MHz, the United Kingdom 340 MHz, and the Netherlands 355 MHz.

In the wake of past policy errors lies tremendous opportunity. The FCC has spent eight years inconclusively drafting and redrafting network-sharing rules, with ill effects spilling over to capital markets. But the time has not been entirely wasted; in markets and laboratories around the world, technologies have been moving forward. Today, network competition for last-mile connections, both voice and data, is already taking substantial market share. The emerging alternatives offer the benefits of retail competition without the distortions of price signals set by regulators rather than by markets.

This points to sustainable, efficient rivalry, with incumbent carrier phone lines challenged by cable telephony (including VoIP over cable modem broadband service) and by mobile wireless. Numerous other competitors wait in the wings or are already operating on the margins, including satellite broadband (delivered to about 228,000 households today),[27] fixed wireless (with about 140,000 subscribers),[28] and broadband over power lines (BPL), now in trials. With VoIP maturing, any high-speed connection becomes a competitor to voice service offered by the local telephone exchange.

Invigorating these ready and able competitive platforms becomes the obvious regulatory exit strategy. Fortunately, these "category killers" are ready for prime time and are already attracting millions of customers in head-to-head rivalry. This report details how policies focused on mandatory network sharing deter the emergence of viable long-term competition and asserts how critical it is to the health of the U.S. economy to resolve the conflict in incentives yielded by telecommunications regulation.

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27 Legg Mason, *2003: A Banner Year for Broadband as DSL Gains Momentum* (Mar. 5, 2004). Backup data were provided by Legg Mason.

28 As of year-end 2003, the FCC has found that there were about 367,000 "satellite or wireless" subscribers to broadband service; subtracting the DirecTV subscribership yields a residual of approximately 140,000. Federal Communications Commission, *High-Speed Services for Internet Access: Status as of December 31, 2003*, Industry Analysis and Technology Division, Wireline Competition Bureau (June 2004), at Table 1; http://www.fcc.gov/Bureaus/Common_Carrier/Reports/FCC-State_Link/ IAD/hspd0604.pdf.

II
REGULATING TELECOMMUNICATIONS COMPETITION

The Telecommunications Act of 1996 ended state telephone monopolies and allowed new local phone carriers to exchange traffic with established networks. While those two reforms have been successful, measures to jump-start last-mile competition through mandatory network sharing have been extremely difficult to craft and have resulted in fierce intraindustry disputes. Now, more than eight years after passage of the Telecommunications Act, the courts have struck down the FCC's framework for determining which network pieces are available for entrants so the industry is without wholesale access rules. Complex regulation has proven unworkable and has resulted in widespread policy confusion and economic uncertainty. In contrast, less-regulated broadband markets demonstrate that strongly competitive networks can emerge without network-sharing mandates.

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The Telecommunications Act of 1996 represented an ambitious attempt to redirect public policy by phasing out regulated monopolies in favor of competition. Policymakers advanced several methods to open markets, including: (1) the abolition of state franchise monopolies; (2) a mandate that telecommunication networks interconnect; and (3) rules enabling telecom entrants to share the networks of incumbents that include both a resale program allowing competitors to buy service at regulated wholesale rates and an unbundling program to make pieces of existing telecom networks—such as local loop connections or switches—available to entrants at regulated wholesale rates. We briefly explain the successful implementation of the first two measures and then discuss the severe problems that have developed with the third.

ABOLITION OF STATE FRANCHISE MONOPOLIES

Before 1996, most states had telecommunications franchise monopolies that restricted local telephone service to one supplier per market. Federal abolition of these monopolies preempted state control and established a national regulatory framework to reverse policies that supported entrenched monopolies. The ability of competitive local exchange carriers (CLECs) to attract capital and offer service in every state following passage of the Telecommunications Act demonstrated the success of this effort to reduce barriers to market entry. By the FCC's count, over 500 CLECs entered the market as of October 2003. See Table II-A. Many of these new companies have now exited the market. Their failures have several causes, including volatile financial markets, competitive pressures, ill-conceived business models, and regulatory arbitrage under price regulation, but the dynamics of the market indicate that policymakers succeeded in eliminating franchise barriers to entry.

Table II-A. Number of Competitive Local Exchange Carriers: 1993–2003

Year	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
CAPs & CLECs	20	30	57	94	129	212	298	479	511	542	563

Notes & Source: CAP = competitive access provider, the name for CLECs before the Telecommunications Act of 1996. Numbers represent CLECs that filed Form 499 (TRS and USF worksheets before 1999). The number of CLECs in 2003 is as of October 22, 2003. Data were obtained from Federal Communications Commission, Wireline Competition Bureau, Industry Analysis and Technology Division, *Trends in Telephone Service* (May 2004), at 5-5 and 8-9.

Eliminating state franchise monopolies not only allowed *de novo* entry but permitted incumbent cable television systems to offer voice service. Several cable operators, most notably Cox Communications, have elected to offer dialtone connections to millions of households. Table I-A shows that by the first quarter of 2004, about 15 percent of total U.S. homes could choose between the cable company and an incumbent telephone carrier when purchasing traditional telephone service. Table II-B, using a different data source, shows a slightly different result.[29]

The competition between cable and telephone companies appears to be intensifying. Internet phone service that tends to be of high quality, competing most directly with the service of established telephone companies, costs the most. Other providers, with slightly less reliable service, already offer VoIP subscriptions that, for just $15 to $30 per month, turn any broadband connection into a telephone. About 600,000 U.S. households now subscribe to such service.[30] Leading providers include the major cable operators, Vonage (with about 200,000 subscribers), and AT&T (which claims it will have 1 million VoIP customers by 2005).[31] As shown in Table II-C, major operator's VoIP deployments are expected to reach over 51 million homes by 2006.

VoIP customers pay monthly broadband subscription charges in addition to VoIP charges, which typically include unlimited domestic calling. Either digital subscriber line (DSL) or cable modem service is now available to approximately nine homes in ten. This means that most residential customers can bypass the incumbent phone carrier's plain old telephone service (POTS) connection for voice, which (with long-distance charges) averages between $30 and $50, by paying $45 to $80 monthly for a package that includes high-speed Internet access and unlimited domestic long-distance calling.

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29 The calculation in Table I-A, based on data from the Leichtman Research Group, is slightly above that estimated by Kagan World Media, reported in Table II-B. The Kagan data indicate slightly more cable telephony subscribers, but somewhat fewer homes passed, than do the Leichtman data.

30 Ben Charny, *AT&T Slashes Net-Phoning Prices*, CNET NEWS.COM (June 15, 2004); http://news.com.com/2100-7352-5235242.html. Note that many more households use software that enables computer-to-computer calls at no additional cost to the broadband subscriber. These voice calls are subject to the traffic delays common to Internet transmissions.

31 Ben Charny, *The Price of VoIP's Thriftiness,* CNET NEWS.COM (July 19, 2004); http://news.com.com/2100-7352-5273275.html.

Table II-B. Cable Telephony: 2003

Circuit-Switched	
Homes Passed (mil.)	14.0
Subscribers (mil.)	2.64
Penetration	18.8%
VoIP	
Homes Passed (mil.)	2.6
Subscribers (mil.)	0.07
Penetration	2.5%
Total	
Homes Passed (mil.)	16.6
Subscribers (mil.)	2.71
Penetration	16.2%

Source: Kagan World Media, *Future of Cable Telephony* (Oct. 2003), at 5.

Table II-C. Major Cable Operator VoIP Deployments

Company	Homes Passed by 2006
Comcast	40,000,000 [1]
Time Warner	11,000,000 [2]
Charter	625,000 [3]
Total	**51,625,000**

Notes & Sources:
[1] By 2006.
[2] 50% of total subscribers in 2004, and the rest in 2005.
[3] 125,000 homes passed so far, and 500,000 to 600,000 more in 2005.
Comcast to offer VoIP to 40 Million by 2006, REUTERS (May 27, 2004); http://smh.com.au/articles/2004/05/27/108546186812.html. Alan Breznick, *More Major MSOs Unveil VoIP Rollout Plans: Charter, Rogers, Mediacom & RCN All Target Major Service Launches*, CABLE DATACOM NEWS (Mar. 1, 2004); http://www.getvanage.net/corporate/press_news.php?PR=2004_03_01_4.

INTERCONNECTION OF RIVAL NETWORKS

The Telecommunications Act of 1996 also mandated that new telecom networks had the right to interconnect with existing networks. Policymakers designed this provision to encourage start-up companies to invest in new facilities, as their customers would capture network benefits via links to other systems.

History provides an illustrative example of the importance of interconnection. When AT&T established the nation's only long-distance service early in the twentieth century, the firm denied competitors access. Customers of rival local phone companies could not obtain long-distance service without subscribing to a Bell System company, because parent company AT&T controlled the patents on switches that made long-distance calls possible. Many of AT&T's rivals failed or were bought out, and emerging competitive forces were nipped in the bud, as the industry consolidated in the form of a local and long-distance service AT&T monopoly.[32]

In 1962, Microwave Communications, Inc. (MCI) filed an application with the FCC to provide private communications services[33] between St. Louis and Chicago, without interconnecting with AT&T's network. AT&T, Western Union, and some other carriers along the proposed route opposed MCI's application and succeeded in delaying action for several years. Finally, the FCC approved MCI's request to compete in 1969, conditioned on MCI's offering only private, nonswitched services.[34] In 1971, the commission generally approved entry into private network services, such as the rights granted MCI. The FCC required AT&T's network to interconnect with the new carriers.[35] The next few years saw conflicts over various aspects of this policy, but in 1975 MCI began offering service to the general public, and the era of long-distance telephone competition had begun.[36]

Interconnection also enabled competition to flourish in wireless telephony. The original cellular licenses, issued in 1984–1989, were distributed to two firms in each local market—one to a company that also provided wireline service and the other to a nonwireline operator. Interconnection to the first firm's wireline system was critical for the firm with no wireline network, whose efforts to attract subscribers would be severely constrained were they unable to connect efficiently to the local fixed-line network—whose owner had financial incentives to avoid providing such connections.

FCC interconnection mandates (enacted before the 1996 act)[37] demonstrated that vibrant wireless competition was viable under this market structure. Companies such as AT&T Wireless, Sprint PCS, Verizon Wireless, and Cingular emerged as vigorous competitors—to each other *and* to their parent companies, AT&T, SBC, Sprint, Verizon, and BellSouth. As a leading telecommunications law treatise summarizes:

> A simple fact is now clear: competition flourishes wherever competitors are assured the same rights of carriage as any other plain old customer. Competition used to be officially impossible in markets for phones, faxes,

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32 Other factors were involved in industry monopolization, including various predatory tactics and state franchise barriers.

33 Private communications involve those within offices of a given company or agency, not accessing the public switched telephone network.

34 Paul W. MacAvoy, The Failure of Antitrust and Regulation to Establish Competition in Long-Distance Telephone Services (MIT Press, 1996), at 12; Gerald W. Brock, Telecommunication Policy for the Information Age: From Monopoly to Competition (Harvard Univ. Press, 1994), at 114.

35 Paul W. MacAvoy, The Failure of Antitrust and Regulation to Establish Competition in Long-Distance Telephone Services (MIT Press, 1996), at 13; Gerald W. Brock, Telecommunication Policy for the Information Age: From Monopoly to Competition (Harvard Univ. Press, 1994), at 126.

36 Gerald W. Brock, Telecommunication Policy for the Information Age: From Monopoly to Competition (Harvard Univ. Press, 1994), at 130–35.

37 Peter W. Huber, Michael K. Kellogg, and John Thorne, Federal Telecommunications Law (Aspen L. and Bus., 1999), at 406–12.

> and private switches, as it was in markets for long-distance and for wireless telephony. As soon as competitors won rights to interconnect with landline networks, competition thrived. All the theories about natural monopoly and the inherent efficiencies of exclusive franchises collapse when common carrier rules guarantee carrier-to-carrier interconnection.[38]

NETWORK-SHARING REGULATIONS

In contrast to interconnection mandates and the elimination of franchise barriers, network-sharing mandates have been far more problematic to devise and implement. Three basic concepts follow from the Telecommunications Act of 1996: total service resale, unbundling policy for network elements, and the pricing of unbundled network elements.

Total Service Resale

Incumbent networks offer their voice service at wholesale prices to competitors, who then retail the service to final customers. To establish TSR wholesale prices, state regulators use existing retail rates (regulated by state commissions) as a baseline and then deduct the costs avoided by the incumbent network when a competitor enlists retail customers. Discount margins (the regulated retail price minus the regulated wholesale price) have been set at 15 to 25 percent.

Unbundling Policy for Network Elements

This determines which parts of the incumbent's network rivals may rent separately at regulated wholesale rates. Each part is called an unbundled network element. The local loop connecting a home user to the local phone company's central office would be an example of a UNE, as would the telephone switch redirecting the user's voice traffic in the central office. The FCC has identified about nine such elements, depending on circumstances.[39] Under the 1996 act, CLECs should have access to a UNE whenever lack of access would "impair" competitive entry.[40] Under FCC rules, CLECs can use all parts of the ILEC's network and resell them as a package, an outcome called UNE-platform. This has become the leading resale mode, exceeding TSR lines since 2001, because UNE prices typically fall far below TSR rates.

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[38] *Id.* at 536–37.

[39] Unbundled network elements include local loops, subloops, network interface devices, circuit switching, packet switching, dedicated transport, shared transport, signaling networks and call-related databases, and operations support systems. *U.S. Telecom Ass'n v. FCC,* 290 F.3d 415 (D.C. Cir. 2002), at 4–5.

[40] Telecommunications Act of 1996 § 251(d)(2)(b) (Jan. 3, 1996). Jerry Hausman and J. Gregory Sidak, *A Consumer-Welfare Approach to the Mandatory Unbundling of Telecommunications Networks*, 109 YALE L.J. (Nov. 24, 1999).

Pricing of Unbundled Network Elements

Under the Telecommunications Act, government regulation is a fall-back when incumbents and entrants fail to negotiate network-sharing arrangements, but, in practice, federal and state rules have displaced private bargaining. The FCC has established the framework under which wholesale terms and conditions are set, while state regulators then fix actual rates. The pricing of UNEs differs markedly from the "avoided cost" methodology used to set TSR rates. UNE prices mimic the costs that would face an ideally efficient firm—the "efficient-firm cost standard"[41]—building a new network deploying state-of-the-art technology. The model seeks to identify total long-run incremental cost. As technology improves productivity, TELRIC prices fall over time and put wholesale prices below those actually incurred by existing networks, which use irreversible investments made in the past.

With interconnection, networks trade traffic. This means that upstart operators can arise to challenge dominant suppliers because customers of the former can link to users or network services of the latter. Network sharing, however, requires incumbents and entrants to use the same physical network to offer service to customers. These arrangements appear to work in some cases. For example, national wireless providers such as Virgin and TracFone have attracted millions of subscribers without owning the base stations (or mobile phone licenses) necessary to provide wireless service.

The mobile phone resale model is premised on an agreement between competing parties—what has been called doing business with the enemy.[42] These conflict-management devices spell out the responsibilities of the parties, impose long-term obligations, and often distribute equity shares to promote cooperation. For example, Sprint PCS reached an agreement with Virgin to let the latter use its facilities for nationwide (U.S.) resale service and acquired 50 percent ownership of the joint venture created.[43] These terms deal with traditional economic organization problems involving shirking and opportunism. Such problems are particularly severe when one party sinks capital in long-lasting, irreversible assets but depends on the performance of partners to achieve profits.

When rival firms share fixed assets, differences in the parties' interests cause difficulties, even when the firms craft a mutually beneficial contract. For instance, Comcast (the largest U.S. cable operator) recently announced that it was ending its build out of standard (circuit-switched) telephone service, in favor of VoIP, in part because Comcast does not want to rely on the AT&T switches it leases to route its phone traffic.[44]

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41 Dennis L. Weisman, *Did the High Court Reach an Economic Low in Verizon v. FCC?* 1 REV. NETWORK ECON. 90 (Sept. 2002), at 94–96.

42 Robin Duke-Woolley, *MVNO: Doing Business with the Enemy?* E-PRINCIPLES.COM (June 2001).

43 *Sprint and Virgin Announce Joint Venture*, MOBILEINFO.COM NEWS (Oct. 2001); http://www.mobileinfo.com/news_2001/issue42/sprint_virgin.htm. "Under the agreement, Sprint PCS and Virgin will have an equal share and mutual governance of Virgin Mobile USA."

44 "Comcast will not actively attempt to grow its circuit-switched subscriber base, primarily because the financial benefit of doing so is minimal. 'That's because Comcast still leases switches from AT&T in its constant bit rate phone markets. The arrangement with AT&T is not exactly what we would like.

The situation is predictably much worse when regulation, rather than mutual interest, brings the parties together.

Under FCC network-sharing rules, instead of being motivated by contract terms that encourage mutually reinforcing behavior, both the host network and the reseller have strong incentives to increase their profits at the expense of their "partners." That happens because outside parties, rather than the firms themselves, arrange the transaction. Theoretically, the regulator could devise rules initially pleasing both the incumbent and the entrant, but the parties would still have strong incentives to lobby for more favorable terms, to be awarded at the expense of the losing party. The normal market incentives for cooperation disappear because "contract" terms between incumbent and the reseller are involuntary.

AN EIGHT-YEAR BATTLE OVER NETWORK-SHARING RULES

The wars over network-sharing rules required by the Telecommunications Act of 1996 have produced no clear answers to myriad questions about the use of incumbents' networks. Market rivalry has given way to a telecommunications sector "war of the roses." As University of Chicago law professor Richard Epstein concludes, "forced marriages based on accidental happenstance have little chance of success."[45] Epstein emphasizes the degree of difficulty by reference to common-law rules that try to avoid the complexity that mandatory network sharing creates:

> As is well understood by the drafters of the 1996 Act, telecommunications is the quintessential network industry so that competition between firms cannot take place without some measure of cooperation, which in turn requires some measure of government regulation. The only question worth asking is which form of regulation minimizes distortions attributable to private opportunism and government overreaching. Here the nub of the difficulty rests in the decision to require the forced sale of UNEs and, by administrative interpretation, UNE-Platforms.[46]

The current status of the law is that, in rough terms, CLECs arguing for favorable wholesale terms have won on the issue of pricing (the key decision rendered in May 2002, when the U.S. Supreme Court refused to overturn the use of TELRIC rates),[47] while ILECs have emerged victorious on UNEs. The latter became apparent after a March 2004 decision by the U.S. Court of Appeals for the D.C. Circuit, characterized by the *Wall Street Journal* as "strike three at the FCC,"[48] that found the FCC's unbundling

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We think we could do better (financially) by controlling our own technology,' [Comcast Senior Vice President Rian] Wren said." Jeff Baumgartner, *Comcast to Stay on the Offensive, Armed with Upgrades and New Services*, CED BROADBAND (July 1, 2004).

45 Richard A. Epstein, *Takings, Commons, and Associations: Why the Telecommunications Act of 1996 Misfired*, Manhattan Institute for Policy Research conference, Tragedy of the Telecommons (May 17, 2004), at 24; http://www.manhattan-institute.org/pdf/cde5-17-04_epstein.pdf.

46 *Id*. at 11.

47 *Verizon Communications v. FCC*, 122 S.Ct. 1646 (2002).

48 *Strike Three at the FCC*, WALL ST. J. (Mar. 4, 2004), at 1.

rules illegal because they make network-sharing rules excessively expansive. By overextending sharing opportunities, regulators promoted resale competition at the expense of facilities-based entry. Because the Telecommunications Act explicitly aimed to create new networks, the court held that policies undercutting this goal violate the law:

> After all, the purpose of the Act is not to provide the widest possible unbundling, or to guarantee competitors access to ILEC network elements at the lowest price that government may lawfully mandate. Rather, its purpose is to stimulate competition—preferably genuine, facilities-based competition.[49]

The ruling, uncontested by the FCC or the Department of Justice,[50] effectively eliminated UNE rules as of June 15, 2004. Regulators are now trying to establish new policies to replace them. Hence, while a legal pricing methodology exists for wholesale access to incumbents' networks, no legal framework exists for determining to what those prices apply. One can fairly say that, after nearly a decade of rulemakings, a stalemate exists such that policymakers have yet to define network-sharing regulations.

POLICY FAILURE

This problem is sufficiently fundamental that Gerald R. Faulhaber, a former chief economist at the FCC, analyzed it in an article published in 2003. Evaluating situations in which "policy-induced competition" in telecommunications has succeeded, and those in which it has failed,[51] he finds that policy-induced network competition may occur when one of two conditions is satisfied:

1. Network-sharing policies are relatively uncomplicated because they police a frontier whose use is simple to define in company-neutral terms; or

2. Incumbent networks, saddled with line-of-business restrictions, are prohibited from operating in certain markets.

He notes that the equipment market (manufacturing telephones, switches, etc.) was opened to competition in the 1970s, even as AT&T continued to enjoy substantial monopoly power over local and long-distance phone service, because a modular interface allowing non-AT&T devices to plug into the network was easy to devise. Alternatively, competitive entry occurred in long-distance markets in the 1980s when the Bell System was divided such that "Baby Bells" that remained local monopolies did not provide long-distance services, which used local facilities to connect to end-users.

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49 *U.S. Telecom Ass'n v. FCC*, 359 F.3d 554 (D.C. Cir. 2004).

50 Stephen Labaton, *In Pivotal Case, Bush Backs Off Rule That Eased Phone Line Fees*, N.Y. TIMES (June 10, 2004).

51 Gerald R. Faulhaber, *Policy-Induced Competition: The Telecommunications Experiments,* 15 INFO. ECON. & POL'Y 73 (2003).

With mandates that CLECs share ILEC facilities, the Faulhaber framework predicts failure. The regulatory goal is overly ambitious, because it requires imposing an entirely new business model on massive infrastructure created to provide service in a far different manner. This means that artificial lines must be drawn to split up assets so as to satisfy regulatory goals rather than to produce market efficiencies. Faulhaber writes:

> In brief, Congress and the FCC acted to insert a market boundary deep within the RBOC [regional Bell operating company] local exchange networks, at the heart of their operations. This market boundary involved extremely rich information flows across it, resulting in high transaction costs. In order to ensure equality of treatment of CLECs, a highly detailed regulatory scheme has flourished, complete with extensive reporting and monitoring requirements. As with all regulatory schemes, this also facilitates extensive complaint procedures and appeals as market participants tested the FCC and the courts' willingness to enforce the new regulations. It is the complexity of the market boundary which forces a complex regulatory regime to manage that market, and uncertainty and vagueness that encourages the legal and political gaming that results in very high political transactions costs. Thus, I hypothesize that the lack of a clean, simple market boundary … is a significant factor in the relative lack of success of this attempt to introduce competition into local exchange.[52]

Faulhaber considers two solutions to this problem. The first would require that ILECs be prohibited from providing local retail services. The second would replace network-sharing rules with policies to encourage intermodal competition by rival networks, most important cable television companies and wireless telephone operators. He strongly favors the latter solution, because, as noted above, he considers unbundling of network elements unlikely to spur competition in the local loop, even with full divestiture. Rival networks, he argues, are already displacing local dialtone service provided by ILECs by changing the way markets are organized—they are "category killers."[53]

PROPERTY RIGHTS AND INVESTMENT INCENTIVES

Regulatory uncertainty pursuant to the Telecommunications Act of 1996 has increased the risk associated with investments in telecommunications networks. Yet, even if network-sharing rules were stable, they would offer sharp investment disincentives. This is so because the rules price access to the incumbent's network to match the best deal that any actual network could achieve. The U.S. Court of Appeals for the D.C. Circuit explains this point in a recent decision:

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52 *Id.* at 86.

53 *Id.* at 94–95. Faulhaber offers several important policy reforms for promoting intermodal competition. We discuss these measures in Section V after reviewing alternative delivery platforms in Section IV.

> The statute says that the ILECs may charge a "just and reasonable rate" for these unbundled network elements ("UNEs"), and the Commission adopted as its standard "total element long-run incremental cost," or "TELRIC." Under this criterion UNE prices are to be "based on the use of the most efficient telecommunications technology currently available and the lowest cost network configuration, given the existing location of the incumbent LEC's [local exchange carrier's] wire centers." In litigation over this pricing rule, which the Supreme Court upheld in *Verizon Communications v. FCC*, it appears to have been common ground that, because of ongoing technological improvement (among other things), prices so determined would fall well below the costs the ILECs had actually historically incurred in constructing the elements. Certainly the ardent preferences of the parties as to the scope of the Act's unbundling requirements—the ILECs seeking a narrow reading, the CLECs seeking a broad one—suggest such a relationship.[54]

The anticipation that prices paid for wholesale access will not fully remunerate investors deters infrastructure investment in incumbents' networks.[55] Similarly, entrants are deterred from constructing competing networks both because their investors would be undercompensated (as consumers shop for the low prices regulators make possible via resale of the incumbent's system) and because they, having yet to sink capital in infrastructure, can themselves take advantage of the discount infrastructure leasing program sponsored by regulators. These disincentives undermine the stated goal of the Telecommunications Act to promote the creation of competing networks.

Supporters of network sharing argue that other incentives offset reasons for not investing in infrastructure. Network-sharing rules may benefit entrants by offering economies of scale in infrastructure deployment (from not having to build a network, but using just part of existing facilities shared with others) and marketing (where regional or national advertising campaigns can be used, service territories extending widely—using resale—even with start-ups). According to this view, once a substantial customer base is established, the entrant will naturally want to develop its own infrastructure for strategic reasons and will then be better able to raise the capital needed to construct a rival network.

This theory has the incumbent defensively increasing investment, as well. In anticipation of CLECs' soon launching independent, competitive networks, ILECs will seek to improve their own networks. The expectation is crucial, because the incumbent will not likely create a superior network as a strategic reaction only to share it with rivals. As Faulhaber writes:

> The provisions for resale and local loop unbundling in the Telecommunications Act were intended to … enable new entrants to get a

54 *U.S. Telecom Ass'n v. FCC,* 359 F.3d 554 (D.C. Cir. 2004), at 4 (citations omitted).

55 See Robert S. Pindyck, *Mandatory Unbundling and Irreversible Investment in Telecom Networks*, NBER WORKING PAPER w10287 (Feb. 2004).

start in the market, followed by a buildout of their own facilities. Resale was a stepping stone to full-blown facilities-based competition.[56]

But in assisting new entrants in what is presumably a difficult task, regulators pursue a delicate balance. If network-sharing rules are overly generous (i.e., UNEs too extensive and wholesale prices too low), new entrants will find that the relative cost of building a network has risen. It is now cheaper to rent than to buy; investment incentives for the CLEC to build a network evaporate. An ILEC's incentives to invest in upgrades are reduced because it is forced to share facilities with rival CLECs. The policy transfers profits from those who invest in expanded network capacity and/or functionality and effectively serves as a tax on capital.

Resale competition may work to lower retail rates, but consumer effects are ambiguous. That is so because the fate of future retail use is largely in the hands of capital markets, where investors decide how much to expend to improve existing networks or to risk building new ones. When retail prices are reduced not because of new efficiencies but via regulation of wholesale prices, the signal sent to investors is to curtail investment in new systems, even when consumer demand is strong. Capital expenditures, including those for maintaining existing facilities, fall.

A simple hypothetical demonstrates the problem. Suppose that UNE-P rates for using the SBC network in San Antonio, Texas, were set at zero. CLECs would presumably rush to offer highly discounted retail services. SBC would invest nothing to maintain the system, and competing networks such as cable telephone systems would deter build out as consumers flocked to the artificially low rates of a rival system.[57] In short, one cannot evaluate the retail price reductions without reference to investment effects. Moreover, the reduction in network build out (by both incumbents and entrants) is highly inefficient if it results in undersupplying services demanded by consumers.

While the theory that network sharing is a "stepping stone" that spurs the creation of new telephone networks is plausible, the worst outcome for mandatory network-sharing rules would be to establish long-lived resale policies, which deliver neither the social benefits of platform choice, nor additional capacity. Mandatory network sharing ensures that the government, not the market, sends the price signals that guide investors considering whether to put their capital into telecommunications enterprises. Economists Gregory L. Rosston and Roger G. Noll write of the possibility that

> when the dust settles, most local access competition will take the form [of] resale of the incumbent's facilities. In this case, consumers are not likely

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[56] Gerald R. Faulhaber, *Policy-Induced Competition: The Telecommunications Experiments,* 15 INFO. ECON. & POL'Y 73 (2003), at 92.

[57] Were the depreciation of the SBC system in San Antonio to proceed rapidly enough, it might actually accelerate investment in the alternative cable telephone network. This would not be a proconsumer outcome, however, as the new system would simply replace the old one destroyed by regulation. The assumption in the text is that depreciation occurs gradually.

> to benefit, and regulation will, if anything, grow as regulators are called upon to resolve disputes between incumbents and resellers.[58]

If regulators could produce an ideally efficient pricing structure, of course, the whole cumbersome structure of UNEs and TELRIC pricing models would be superfluous. Retail price caps would be set to the most efficient level, and competitive entry would be unnecessary. But ideal prices are impossible to determine. And the side on which regulators have erred is clear.

As seen in Figure II-A, UNE-P line growth has been explosive since 1999, when competitive local phone service was largely delivered by TSR or facilities-based lines. Since then, however, UNE rates have generally been lowered (often in conjunction with state regulatory proceedings to consider RBOC entry into long-distance markets),[59] and UNE-P has become the dominant CLEC service mode. The growth of competitive lines provided by new CLEC networks ("CLEC-owned lines"),[60] including those provided by cable companies, has stagnated. As of December 2003, UNE-P accounted for about 15 million of the approximately 30 million CLEC lines; UNE-P and TSR collectively accounted for about 20 million.[61]

Excluding cable telephone lines, CLEC-owned lines actually *declined* in number from December 2000 through December 2003. This means that not only are noncable CLECs declining to invest in new network facilities, but they experienced a net loss of customers from *existing* facilities during this period of robust UNE-P line growth. Given UNE-P pricing—on average, about a 53.5 percent discount from retail prices[62]—facilities-based entry stopped. This is inconsistent with the stepping-stone theory, which implies that increases in resold lines will soon generate competitor-owned lines. We observe the reverse.

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58 Gregory L. Rosston and Roger G. Noll, *The Economics of the Supreme Court's Decision on Forward-Looking Costs,* 1 REV. NETWORK ECON. 81 (Sept. 2002), at 88–89.

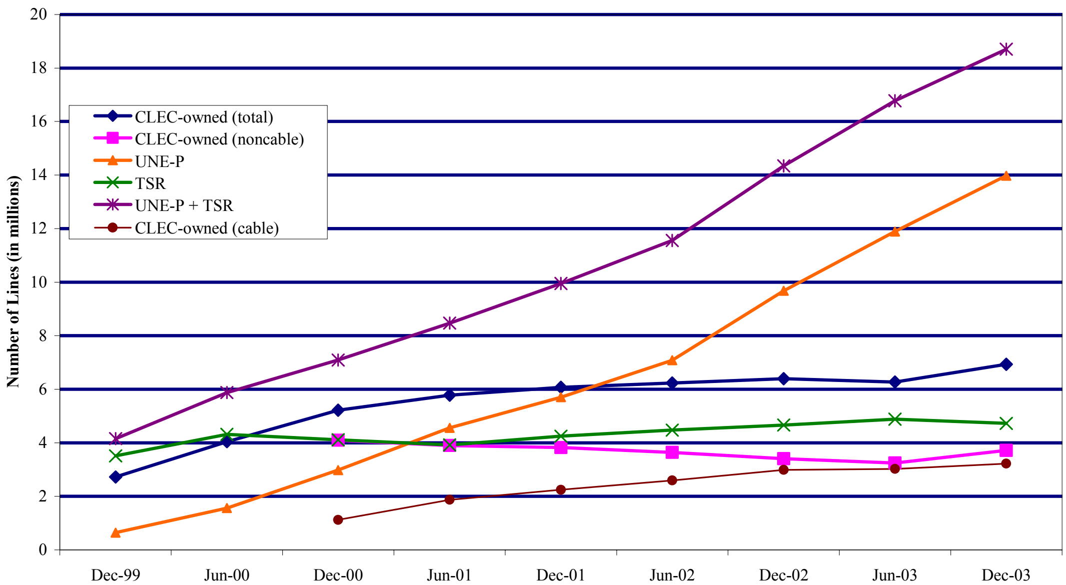
59 The Telecommunications Act of 1996 created a fourteen-point checklist with which each RBOC had to comply before it could enter the long-distance telephone market in its local service territories. Pursuant to the requirements in Section 271 of the act, RBOCs then could petition the FCC for authority to offer long-distance service on a state-by-state basis. State commissions and the Justice Department would play a conservative role in the process. On January 2, 1997, Ameritech filed the first petition for Section 271 approval to provide long-distance service in Michigan, and several petitions followed, but the FCC approved no filing until December 22, 1999, when the commission granted Verizon's New York petition. All state approvals were completed as of December 3, 2003 (when Qwest's Arizona petition was approved).

60 "CLEC-owned lines" may be leased ILEC loops, but they otherwise provide network infrastructure.

61 Federal Communications Commission, *Federal Communications Commission Data on Local Telephone Competition* (June 18, 2004), at Tables 3 and 4.

62 *The Far-Reaching Impact of UNE-P Regulation*, MOODY'S INVESTORS SERV. (Oct. 2003), at 5.

Figure II-A. CLEC Lines by Type: December 1999–December 2003



Notes & Source: CLEC-owned (noncable) = CLEC-owned (total) – CLEC-owned (cable). UNE-P lines = (ILEC UNE-P lines / ILEC total UNEs) X CLEC UNEs. Data are from Federal Communications Commission, Wireline Competition Bureau, Industry Analysis and Competition Division, *Local Telephone Competition: Status as of December 31, 2003* (June 2004), Tables 3–5.

Cable system voice circuits, which operators can create for about $527 per traditional telephone customer (and less for a VoIP customer),[63] are an obvious source of competition. Yet cable telephony build out has been slow, despite the opportunities afforded by existing investments and the emergence of Internet-based voice applications. Analysts have concluded that UNE-P prices have undermined cable company phone investments. For instance, Fulcrum Global Partners recently wrote:

> [In] markets where the competition between RBOC and reseller remains especially fierce, it simply may not make sense for a cable company to aggressively rollout a telephony-like offering that has little chance of success … . If UNE-P based resale discounts were not as staggeringly high as the five Midwestern public utility commissions had mandated them to be, the[n] cable telephony, a far more sustainable form of competition in our opinion, would have at least had a chance of survival in the five-state Midwestern region. Eliminating UNE-P based resale altogether would offer incentives to cable companies to pursue such a customer base without the fear that 50 or more local resellers, with little capital requirements, would flood the market.[64]

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63 This assumes 20 percent penetration. Cox Communications, White Paper, *Voice over Internet Protocol: Ready for Prime Time: Cox Communications' Successful Deployment of VoIP* (May 2004), at 11.

64 *Wireline Communications: Revising BLS and SBC Estimates Due to AWE Dilution,* FULCRUM GLOBAL PARTNERS (Mar. 10, 2004), at 7.

Regulation should encourage this intermodal rivalry. In fact, the existence of cable's competitive wireline system could create wholesale market opportunities were resale to prove a viable business model. Cable and telephone companies could use the market to determine how to customize network-retailer relations efficiently.

The idea of market cooperation is not mere conjecture. Insight Communications, a cable operator serving about 2 million subscribers primarily in Indiana, Kentucky, and Ohio, leases its local loop facilities to Comcast (which purchased the original contract when it bought AT&T Broadband in 2002). Comcast places its telephone switches in Insight's offices to route voice traffic to the public telephone network. Insight's annual report describes the firms' agreement to split costs and revenues.[65] Currently, of some 715,000 households passed, about 60,000 receive this phone service.[66]

Market and financial analysts have reached a broad consensus that the resale opportunities now put in place by regulation suppress incumbents' and competitors' investments in network facilities, a conclusion reinforced by telecommunications sector investment trends discussed elsewhere in this report. These analysts believe that wholesale rate regulation directly threatens profitability and offers very little opportunity for entrants. This relates to the nature of reselling when no unique assets are used and when retail-wholesale price margins are closely regulated. The generous "profit opportunity" seemingly awarded new competitors disappears in retail discounts and customer acquisition costs.[67] Despite serving more than 4 million UNE-P lines, a recent evaluation by Legg Mason considered AT&T's entire retail local residential business essentially worthless. Analysts concluded that "the durability of UNE-P remains relatively immaterial to long-term sector valuations" and singled out both AT&T and Sprint.[68] A selection of comments illustrating the consensus view by telecommunications analysts appears in Appendix II.

Also informative are the views of telecommunications equipment manufacturers. Companies such as Intel, Nortel, and Cisco sell key network components to a wide array of customers. The firms are indifferent to transfers between telephone companies but desire healthy economic conditions that give investors incentives to build networks and upgrade existing facilities. The manufacturers gain, in particular, with the construction of advanced networks (such as broadband-related markets), which may stimulate the provision of innovative services.

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65 Insight Communications, SEC Form 10-K, December 31, 2003, at 6.

66 A recent transaction, set to close in 2005, assigns the phone business to Insight from Comcast. *Insight Buying Out Comcast in Telephone Partnership*, BUS. FIRST (July 8, 2004); http://www.bizjournals.com/louisville/stories/2004/07/05/daily22.html. The multiyear venture speaks to the possibility of an unregulated wholesale access market, while the merger may suggest efficiencies from vertical integration.

67 Thomas W. Hazlett and Arthur M. Havenner, *The Arbitrage Mirage: Regulated Access Prices with Free Entry in Local Telecommunications Markets*, 2 REV. NETWORK ECON. 440 (Dec. 2003).

68 Legg Mason, *Bush Administration Declines to Back FCC Appeal of D.C. Circuit's Pro-Bell Triennial Review Ruling* (June 9, 2004). AT&T, SEC Form 10-Q, June 30, 2004, at 26 and 28.

These manufacturers have repeatedly argued that compulsory network sharing can be dangerous for investment and should be applied lightly if at all. A good example appears in comments Nortel filed with the FCC in 2002:

> Telecom service providers will not invest in infrastructure when regulatory burdens adversely affect the viability of business cases and shareholder return on investment. Without such investment, the equipment suppliers and solutions providers that create innovation will be unable to sustain their research-and-development efforts. The present unbundling and pricing rules result in disincentives to investment on both sides of the issue—for ILECs because they're required to unbundle and for CLECs because they have much to gain by waiting for ILECs to construct facilities instead of building their own.
>
> A Vicious Cycle. Like every other business, carriers need the freedom to earn a market-based return on their investment. Unreasonably low, regulated pricing of network elements by definition prevents a market-based rate of return, inevitably resulting in less infrastructure investment. This, in turn, leads to less spending with technology suppliers, which leads to less money available for technology companies to invest in developing new technology, resulting in a negative impact on innovation. Productivity and the overall economy are adversely affected. This is the vicious cycle we are facing today. This cycle must be interrupted.[69]

THE BROADBAND RACE

The competition between cable modem and digital subscriber line service is an important part of the regulation story, both because this rivalry serves as a test bed for unbundling rules and because broadband services directly compete with telephone service via emerging voice over Internet protocol applications. High-speed Internet connections now provide subscribers with basic phone service and do so at reasonably competitive prices. We discuss the rivalry between broadband and traditional telephony in Section IV. Here we discuss lessons concerning network-sharing rules.

The two principal forms of residential broadband access are subject to two distinct regulatory regimes. Cable modem service uses the cable TV system platform, and the system owner is under no legal obligation to open that facility for use by others. Despite considerable political pressure to impose "open access" rules allowing rival Internet service providers (ISPs) wholesale use of the high-speed last-mile links, cable modems remain unregulated. As proprietary, vertically integrated networks, cable operators determine how to serve customers and can package access to their networks that is based solely on profit considerations.

[69] Ex parte Comments of Nortel Networks, *In the Matter of Review of Section 251 Unbundling Obligations of Incumbent Local Exchange Carriers,* CC Docket No. 01-338 (Sept. 30, 2002), at 2.

Digital subscriber line service, on the other hand, is delivered over telephone lines—specifically, the twisted copper pairs of the local loop. These connections are UNEs and must be rented to others at prices set by state regulators using FCC guidelines. Until recently, the states were free to set DSL local access rental fees based on the cost of using only part of the local loop, the high-frequency portion that is best used for data. Because this portion can be used when the low-frequency portion is simultaneously delivering telephone calls, incremental costs are very low. But the FCC's February 2003 decision to end "line sharing" eliminated the option to lease only part of a loop. This decision carried important implications.

The disparate regulatory treatment of broadband platforms is striking: cable is a "closed" platform, while DSL's telephone company platform is "open." Rivals have a right to rent incumbent telephone carrier loops at regulated wholesale rates to provide DSL and compete with the telephone company head-to-head for retail customers; those wishing to use cable facilities must negotiate an agreement with the cable operator. The upshot is that mandatory network-sharing rules apply in large part for DSL and not at all for cable modem service.

This suggests an empirical test. Since the rival regimes are in sharp contrast, which one best encourages new investment and product improvements? If mandatory sharing rules achieve their objective of encouraging efficient new entrants, then the "open" platform should outperform the "closed" one. This performance could be measured in price and quality, but quality measurement is difficult, and data are elusive. An alternative test, for which data do exist, uses output as measured by subscribership. Conveniently, this incorporates supplier incentives to deploy service and to offer preferred quality-of-service levels. It assumes that cable modem service and DSL are good substitutes for each other, which seems reasonable.

In the early days of the broadband race, many credible sources predicted DSL as the ultimate winner. These included expert prognosticators who saw the burden of cable modem deployment as the greater handicap, as noted in the following 1997 report from ZDnet:

> Cable modems: May want to write the obit on this one. *PC Week* reports vendors are backing away from cable, given competition from digital subscriber line technology and cable's massive implementation headaches. Hewlett-Packard, IBM and Intel among those reportedly throwing in the towel.[70]

But cable operators soon began investing aggressively to upgrade existing infrastructure and became far more successful in making broadband service available. By the end of 2003, cable modem service was offered to 90 percent of households passed by cable TV lines, while DSL service was available to only 66 percent of households

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[70] Jon C. A. DeKeles, *Don't Get Robbed on the Road to Faster Access*, ZDNET (May 29, 1997); http://www.zdnet.com/chkpt/adem2fpf/www.anchordesk.com/story/story_931.html.

passed by telephone networks.[71] Cable companies maintain an even healthier advantage in subscribers. As of December 2003, FCC data show 16,446,322 cable modem subscribers, compared with 9,509,442 for DSL.[72] Thus far, the less-regulated "closed" platform has been far more popular than the more-regulated alternative.[73]

The trend may be changing, however. A major shift in regulation came in the February 20, 2003, FCC order that altered a network-sharing rule key to DSL provision by entrants. The order stated that "the Commission will no longer require that line-sharing be available as an unbundled element"[74] and narrowed "open access" requirements to incumbents' facilities used for DSL. Effectively, the ruling substantially raised access rates for competitors.[75] After a phase-in period, CLECs seeking to use ILEC loops to deliver DSL would have to pay for the entire circuit as if they were reselling telephone service.

This prompted dire predictions. A *New York Times* headline on February 21, 2003, announced, "High-Speed Service May Cost More."[76] Other newspapers reported similar forecasts.[77] Several scholars agreed. New York University economist Nicholas Economides wrote:

> In February 2003, the FCC decided to allow incumbent monopolists of local telecommunications networks to charge any price they want for the portion of the network used to provide DSL service. The immediate consequence will be higher Internet connectivity prices and slower growth of the Internet in the U.S. This is possibly the most damaging decision for the Internet that the FCC could take short of formally imposing regulation on the Internet.[78]

The logic of mandatory network sharing rules implies that short-run prices will rise and penetration growth will fall in the wake of the rule change.[79] In fact, broadband

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[71] Congressional Budget Office, *Does the Residential Broadband Market Need Fixing?* (Dec. 2003), at 21.

[72] Federal Communications Commission, Industry Analysis and Technology Division, Wireline Competition Bureau, *High-Speed Services for Internet Access: Status as of December 31, 2003* (June 2004), at Table 1.

[73] See Thomas W. Hazlett and George Bittlingmayer, *The Political Economy of Cable "Open Access,"* 4 STAN. TECH. L. REV. (2003); http://stlr.stanford.edu/STLR/Articles/03_STLR_4.

[74] Federal Communications Commission, *FCC Adopts New Rules for Network Unbundling Obligations of Incumbent Local Phone Carriers* (Feb. 20, 2003).

[75] ALFRED E. KAHN, LESSONS FROM DEREGULATION: TELECOMMUNICATIONS AND AIRLINES AFTER THE CRUNCH (AEI-Brookings Joint Center for Regulatory Studies, 2004), at 43.

[76] Saul Hansell, *Communications Compromise: Internet Access; High-Speed Service May Cost More,* N.Y. TIMES (Feb. 21, 2003), at C4.

[77] Jane Black, *A Not-So-Ringing Defeat for the Bells: While the FCC's Proposed Rules Don't Give Them Relief on Local Service, They Scored Big-Time on Broadband Deregulation,* BUS. WK. ONLINE (Feb. 21, 2003); Ben Charny, *DSL Customers Brace for Higher Prices,* CNET NEWS.COM (Feb. 21, 2003).

[78] Nicholas Economides, *Dial "C" for Competition*, STERN BUS. 40 (Fall/Winter 2003), at 43.

[79] For access regulation to be efficient in this circumstance, it is necessary that it lower prices and increase near-term penetration, even as these outcomes are insufficient to demonstrate a proconsumer

access prices have *fallen* since the FCC decision to end line sharing.[80] Moreover, retail discounting has occurred simultaneously with acceleration in DSL growth. Telephone companies have cut prices, and this appears to have driven an increase in DSL market share.

Figure II-B displays broadband subscriber data from Legg Mason. After the FCC decision ending line sharing, both cable modem and DSL growth continued. But while DSL growth accelerates above trend (extrapolated via the dashed line), no positive growth "bump" occurs for cable during this period.

Figure II-C displays the ratio of cable modem subscribers to DSL subscribers (also using Legg Mason data). The end of line sharing occurs just as the cable modem-to-DSL ratio reaches a local maximum.[81] This indicates that the trend in the ratio of cable modem to DSL subscribers significantly changed after the Triennial Review Order—in favor of DSL.

These results are consistent with alternative broadband usage data generated by public surveys conducted by the Pew Internet & American Life Project that indicate that DSL's growth trend exhibits a sharp increase in the one-year period following the end of line sharing. See Figures II-D and II-E. That consumers appear much more likely to subscribe to DSL, relative to either not subscribing to broadband or subscribing to cable modem service, suggests that the DSL price-quality package increased in value, as judged by consumers, in the wake of changes that reduced DSL regulation. Although other factors may account for observed patterns, the conjecture that access provisions drive broadband competition appears to lack support.

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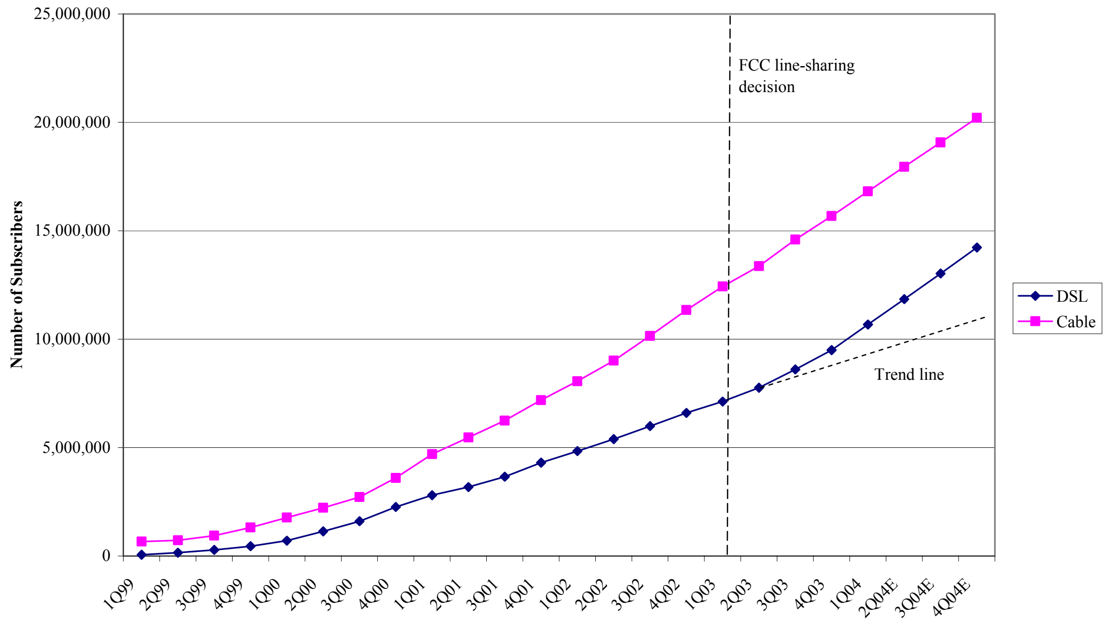
result, which additionally requires that long-term price-quality choices by consumers (which encompass short-run effects) are superior to what they would be in the absence of such rules. Investment choices and other market dynamics enter in the long run.

80 *Falling DSL Prices May Herald a Broadband Sea Change,* 13 BROADBAND BUS. REP. (Nov. 4, 2003); Jon Van, *SBC Gains Strong Lead in DSL Race, Aggressive Price-Cutting and Dealmaking Help Telecom Giant Surge Past Other Phone Companies for Broadband Market Share. Still, Cable TV Operators Add Two Customers for Each DSL User*, CHI. TRIB. (Nov. 14, 2003), at 1; Anick Jesdanun, *High-Speed Internet Soaring as Prices Decrease,* ALB. TIMES UNION (Apr. 19, 2004), at A3.

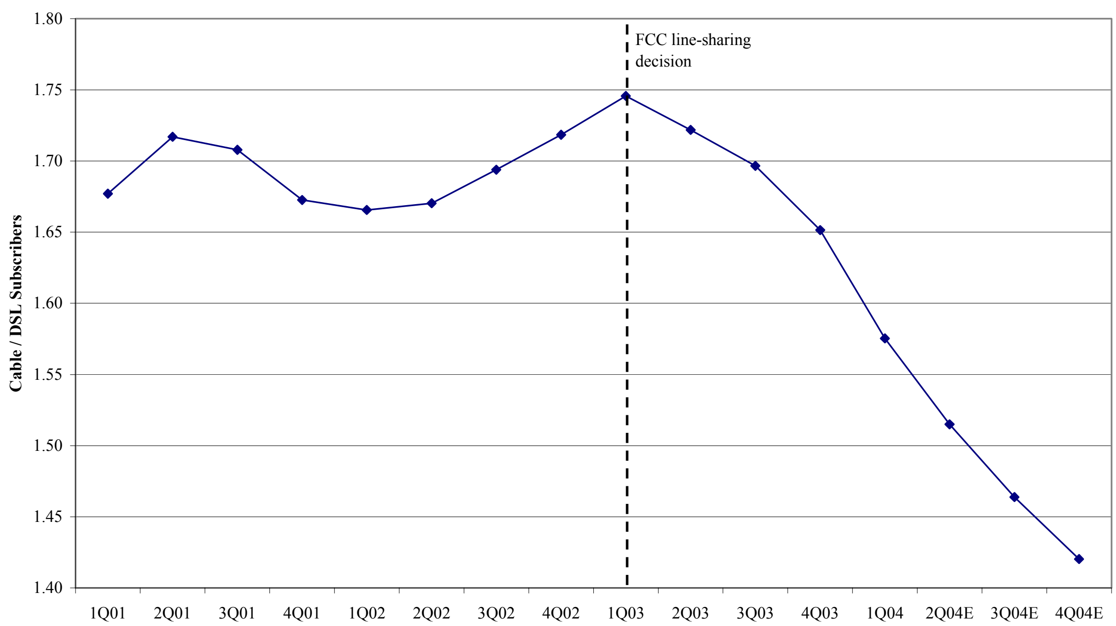
81 A regression analysis estimates that the ratio of cable modem subscribers to DSL subscribers fell sharply following the decision to end line sharing, with the cable modem-to-DSL ratio dropping a statistically significant 0.29. In addition, we estimated a regression with quarterly data from Legg Mason covering the third quarter of 2000 through the fourth quarter of 2004 by incorporating two lags of the dependent variable and a dummy variable for periods after the February 2003 Triennial Review Order (TRO).

Figure II-B. Quarterly DSL and Cable Subscribers: 1999–2004E



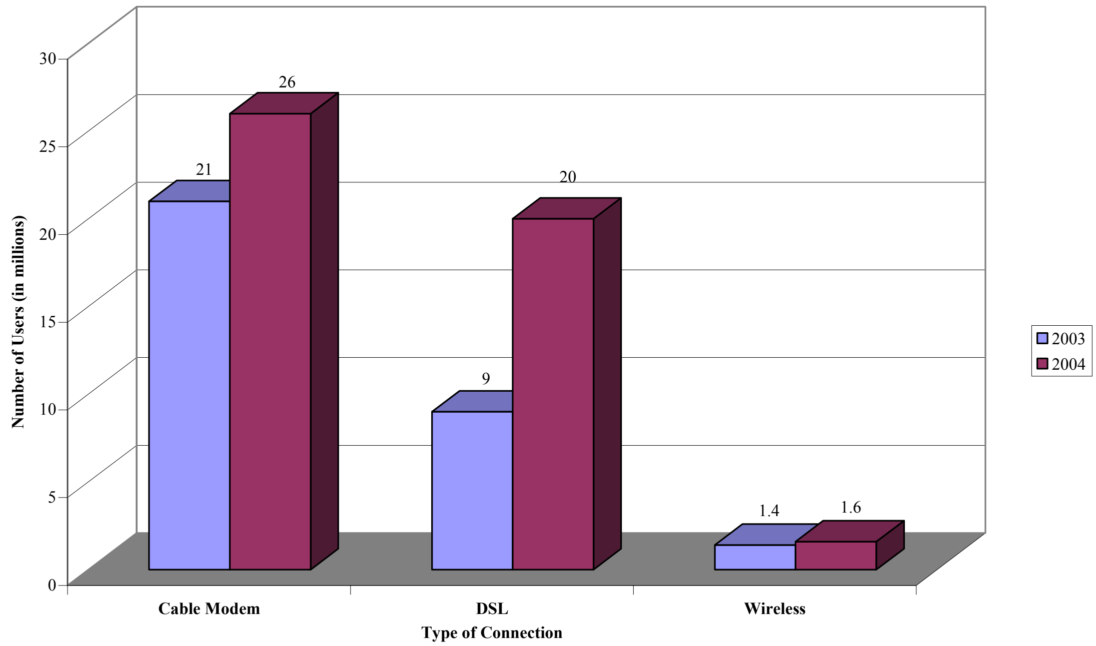
Source: Data were obtained from Legg Mason.

Figure II-C. Ratio of Cable to DSL Subscribers: 2001–2004E



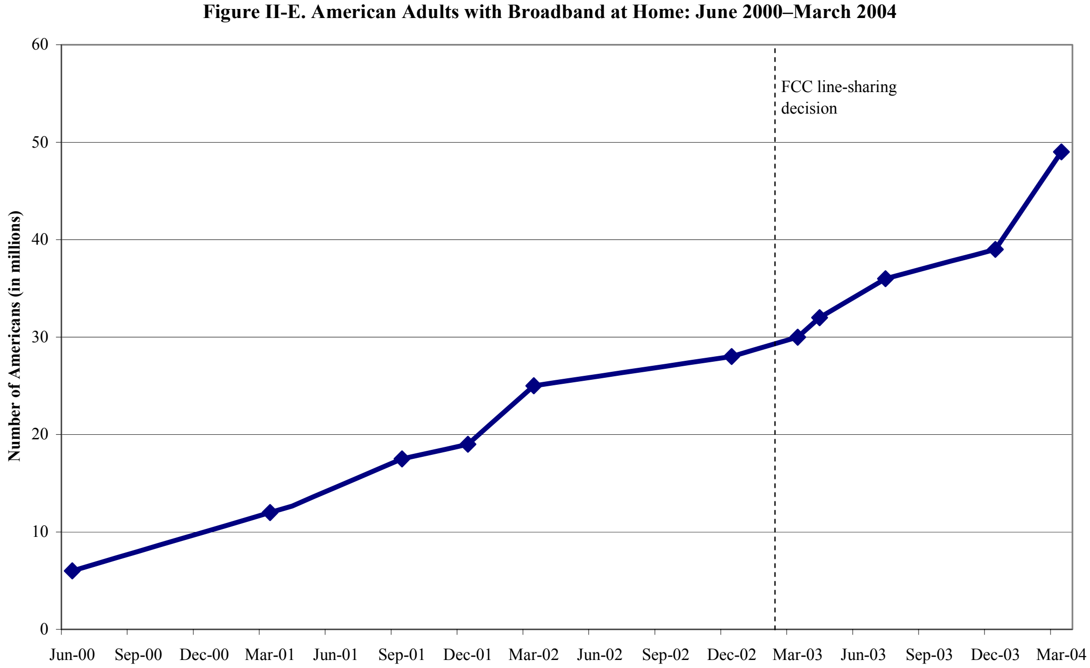
Source: Data were obtained from Legg Mason.

Figure II-D. Composition of Home Broadband Market: 2003 and 2004



Source: John B. Horrigan, *PEW Internet Project Data Memo*, PEW INTERNET AND AMERICAN LIFE PROJECT (Apr. 2004), at 3.

Figure II-E. American Adults with Broadband at Home: June 2000–March 2004



Source: John B. Horrigan, *PEW Internet Project Data Memo*, PEW INTERNET AND AMERICAN LIFE PROJECT (Apr. 2004), at 10.

SUMMARY

The complexity of devising ambitious network-sharing rules to promote last-mile telephone competition has proven more than regulators can handle. Today, the rules are in disarray. The policy failures stand in stark contrast to examples of markets that work. As demonstrated in broadband, head-to-head rivalry outperforms regulation, even with just two principal competitors. Given that a stalemate in the litigation war over unbundling terms is now upon us, alternatives to these controversial provisions must be found. Fortunately, superior procompetition rules are available.

Network-sharing policy should be reformed in two basic ways. First, policymakers should weight the administrative processes, transaction costs, and ripple effects caused by government interventions *ex ante*. Rules that invite contentiousness constitute "attractive nuisances"; litigants cannot be blamed for jamming the system when policies invite arch rivals to try to twist the rules to extract financial benefits. In a study of determinants of regulated telecommunications prices, University of California at Berkeley scholars Rui J. P. de Figueredo, Jr., and Geoff Edwards find:

> [R]egulated prices for access to the local loops of incumbent telephone networks varied from $2.79 per month in downtown Chicago, IL to $7.70 in Manhattan, NY to $12.14 in Houston, TX … . [W]e find a significant effect of private money on regulatory decisions. A one standard deviation increase in the percentage of contributions in an electoral cycle by entrants to the industry is associated with a fall of around three-tenths of a standard deviation in the regulated local loop price (around $1.36 per month).[82]

Policymakers should alter the structure of telecommunications regulation to reduce such influence. This implies lessening the scope, frequency, and economic significance of arbitrary judgments that policymakers render. Ending theoretical pricing rules constituted on the basis of an "ideally efficient competitor," a standard that may itself serve as a powerful deterrent to new investment by entrants,[83] should be an essential part of any reform.

Alternative policies are available to stimulate the creation of rival networks without incurring the collateral damage that today thwarts progress. Competitive networks exist, and additional entrants are on the horizon. The highest priority of regulators should be to create policies to encourage investors to take the risks to develop vigorous competition between communications networks. The success of such a reform effort will redirect

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82 Rui J.P. de Figueiredo, Jr., and Geoff Edwards, *Why Do Regulatory Outcomes Vary So Much? Economic, Political, and Institutional Determinants of Regulated Prices in the U.S. Telecommunications Industry,* Haas School of Business, University of California (May 2004).

83 "The FCC has decreed that the charges for [unbundled network] elements and the resale discounts must emulate the costs of an ideally efficient firm. This standard is in fact not efficient, and the FCC's attempt to jump-start the entry of competitors in this way has short-circuited the competitive process itself." Alfred E. Kahn, Timothy J. Tardiff, and Dennis L. Weisman, *The Telecommunications Act at Three Years: An Economic Evaluation of Its Implementation by the Federal Communications Commission*, 7 INFO. ECON. & POL'Y 319 (1999), at 365.

market forces. Instead of lobbying for more favorable government rules, rivals will compete to offer customers better prices and improved service.

III
ECONOMIC COSTS OF THE CURRENT REGULATORY SYSTEM

Information technologies are vital to U.S. economic health. The telecommunications sector has recently suffered a major depression, however. A financial collapse caused far-reaching job reductions in telecom services (21 percent) and equipment manufacturing (39 percent). Market values plummeted, and many firms went bankrupt. This collapse was due both to swings in financial markets and to sector-specific regulation. The Telecommunications Act of 1996 led to new rules that artificially inflated the expected returns of some businesses and depressed the expected returns of others. Investors flocked to the new opportunities, but when sales growth failed to match expectations, capital flows dried up. Lenders and receivers sold equipment at auction, a move that further depressed demand. The constriction of bank lending also affected nontelecommunications companies and thus reduced their demand for telecommunications services and equipment. Despite growth elsewhere, the telecommunications sector remains stagnant as regulations have reduced the return on network investments. The result has been decreased employment, output, and productivity, along with aging infrastructure and decreased innovation, factors that have reduced U.S. global competitiveness.

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OVERVIEW

The telecommunications sector, like the entire U.S. economy, has been through a recession, but the recent decline in telecommunications equities was particularly severe. Between March 2001 and May 2004, telecom service companies lost 21 percent of their workers, and telecommunications equipment companies lost 39 percent, a total of 380,500 jobs. The sector also lost massive net worth as the capital markets dried up for telecommunications investments.

The interaction of telecommunications regulations and financial market volatility caused the downturn in telecommunications. From 1982 to 2000, the U.S. economy enjoyed a long bull market spurred by a secular decline of interest rates combined with technology-led earnings growth. The Telecommunications Act of 1996 created a new set of rules that artificially inflated the returns of some businesses and depressed the returns of others. Entrepreneurs, eager to take advantage of the new rules, formed a large number of new businesses. Optimistic business plans attracted massive amounts of capital and thus drove up stock price multiples and set the stage for the technology bubble.

When it became clear that actual sales growth would not meet expectations from mid- to late-2000, federal bank regulators pressed banks to reduce lending. Most start-up technology companies had spent the money they raised on operating expenses or nonsalvageable assets; many were pushed into bankruptcy. A tidal wave of telecommunications equipment hit the secondary market as equipment was auctioned by lenders and receivers at about 20¢ per dollar of original cost, a factor that further depressed sales and revenues of telecommunications equipment manufacturers. The constriction of bank lending also affected nontelecommunications companies and dampened prospects for macroeconomic growth.

The overall economy is recovering now, but the telecommunications sector remains depressed. Burdensome regulations have reduced the return on capital below the cost of capital for many of the remaining companies, and policy uncertainty has increased risk for investors; both factors have undermined incentives for capital spending. The result has been decreased growth and fewer jobs. The financial plight of the telecommunications sector has also led to reduced innovation, aging network infrastructure, higher costs for businesses and consumers, less customer choice, and diminished global competitiveness.

ECONOMIC IMPORTANCE OF TELECOMMUNICATIONS

The telecommunications industry serves as the central nervous system of our economy. The health of the U.S. telecommunications network plays an important part in determining both productivity growth and the ability of U.S. businesses to compete in world markets. Although telecommunications output makes up just 2.9 percent of total output,[84] telecommunications networks constitute essential infrastructure that enables commerce by providing the conduit for information flows among consumers, workers, and businesses.

The telecommunications industry comprises companies that provide local, long-distance, and wireless phone services, cable and satellite TV operators, and Internet access providers, along with the firms that manufacture and service all the equipment, components, and applications that we use to communicate, including both hardware and software. These companies had revenues of $721 billion in 2003.[85]

Americans spent $285.3 billion on telecommunications services in 2003.[86] Real telecommunications expenditures have grown at an average annual rate of 6.3 percent since 1987, far in excess of the annual growth rate of 3.4 percent in total real personal

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84 R. E. Yuskarage and E. H. Strassner, *Survey of Current Business Gross Domestic Product by Industry for 2002,* Bureau of Economic Analysis (May 2003), at 9, Table C; http://www.bea.gov/bea/ARTICLES/2003/05May/ 0503GDPbyIndy.pdf.

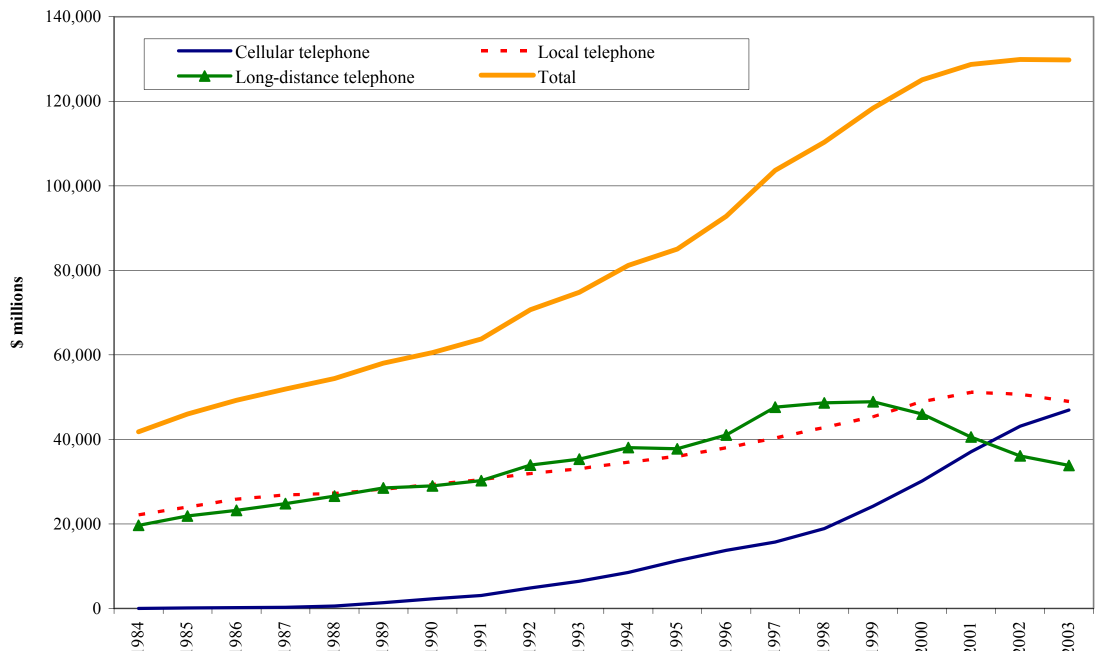
85 R. O. King, *Telecom Spending to Increase, Confidence Returning*, WEB HOST INDUS. REV. MAG. (Apr. 14, 2004); http://thewhir.com/king/telecom-spending.cfm.

86 Telecommunication services include local exchange services, toll service, and wireless services. Telecommunications Industry Association, *TIA's 2004 Telecommunications Market Review and Forecast* (2004), at Table I-1.1.

consumption.[87] Since 2000, spending on wireline long-distance service has declined, a trend facilitated by falling prices and wireless substitution. Local landline phone revenues have declined, as well, since 2001.

Measured on a quantity basis (units of output rather than dollar value of output), the growth of the communications industry has far outstripped that of the overall economy. Since 1987, the communications industry has increased the quantity of services provided by 150 percent, nearly three times as much as real GDP, which grew by 55 percent between 1987 and 2003.[88] On this basis, although the dollar cost share of telecommunications has remained almost constant, U.S. industries use about twice the amount of communications services as they did in 1987, because of falling relative prices. See Figure III-A.

Figure III-A. Personal Consumption Expenditures on Telecommunications: 1984–2003



Source: International Telecommunication Union, adapted from national reports.

According to the eighty-seven industry input-output tables published by the Bureau of Economic Analysis, every U.S. industry except owner-occupied dwellings uses telecommunications in the provision of their output.[89] The largest users of

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87 Bureau of Economic Analysis, *National Income and Product Accounts of the United States, Real Personal Consumption Expenditures* (Aug. 5, 2004), at Table 2.5.3; http://www.bea.gov/bea/dn/nipaweb/TableView.asp?SelectedTable=71&FirstYear=2002&LastYear=2003&Freq=Year.

88 Bureau of Economic Analysis, *Survey of Current Business Gross Domestic Product by Industry for 2002* (May 2003), at 9, Table C; http://www.bea.gov/bea/ARTICLES/2003/05May/0503GDPbyIndy.pdf.

89 Burea of Economic Analysis, *Input-Output Tables* (1999); http://www.bea.gov/bea/dn2/i-o_annual.htm.

telecommunications services, after communications companies themselves, are companies involved in wholesale trade, finance, retail trade, insurance, other business and professional services, real estate, and legal, engineering, and accounting. See Table III-A.

Table III-A. Largest Users of Telecommunications Services by Industry

User Industry	Telecom's Share of User Industry's Intermediate Input Expenditures
Communications	33.0%
Wholesale Trade	6.2%
Other Business and Professional Services (except Medical)	5.5%
Computer and Data Processing Services	5.4%
Legal, Engineering, and Accounting Services	3.7%
Finance	3.7%
Retail Trade	3.7%
Insurance	3.2%
Health Services	2.6%
Real Estate	2.0%

Source: Bureau of Economic Analysis, *Input-Output Tables* (1999).

The nature of business usage differs significantly among businesses. Financial, wholesale, and retail trade companies have moved most aggressively beyond voice applications into data transmission, where they consolidate and evaluate information from multiple locations and operations. Such applications are also beginning to take hold in the medical and insurance fields, where workers file and process claims electronically.

The best-run wholesalers and retailers use telecommunications intensively to track inventory, measure sales at each location and for each product, and order replacements. America's largest retailer, Wal-Mart, has been called "the most unlikely technology company" because it deals in low-cost consumer products with thin profit margins. But Wal-Mart's use of information technologies has allowed it to achieve the highest return on capital of any company in its industry over the past twenty years. By using the latest communications systems, Wal-Mart is able to turn over its inventory twelve times per year, compared with an industry average of four. So despite its 15 percent markup compared with its competitors' 25 percent, Wal-Mart generates $1.80 of gross profit per dollar of inventory compared with $1.00 for its competitors.[90]

EFFECTS OF THE U.S. RECESSION

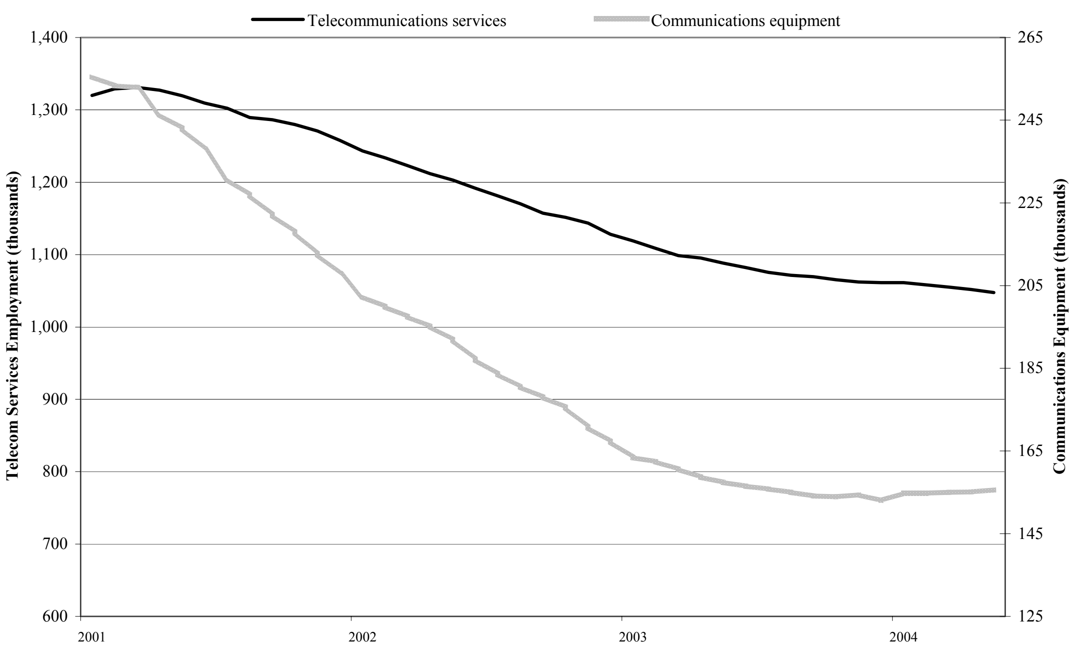
The U.S. recession that began in March 2001 and ended in November 2001 hit the telecommunications industry much harder than other sectors. Although the industry accounted for only 1.2 percent of total nonfarm jobs in the United States in March 2001,

[90] Richard Young, *The World's Most Unlikely Technology Company,* INTELLIGENCE REP. (1999).

the 100,400 workers in the combined telecommunications services and telecommunications equipment industries who lost their jobs during the eight-month recession made up 6.1 percent of the total job losses during the recession. U.S. total nonfarm employment continued to decline until August 2003, by which time job losses totaled 2,718,000; of those, 13.2 percent, or 357,500 were in the combined telecommunications service and telecommunications equipment sectors.[91]

Between March 2001 and August 2003, telecommunications service providers such as Verizon, BellSouth, SBC, Qwest, AT&T, Sprint, and MCI reduced employment by 259,600 workers, a 19.5 percent decrease in workforce, as shown in Figure III-B. Equipment companies such as Lucent, Nortel, and Corning were hit even harder, with employment shrinking by 97,900, a 38.7 percent drop.

Figure III-B. Telecommunications Equipment vs. Services Employment: January 2001–May 2004



Source: Bureau of Labor Statistics, *National Employment, Hours and Earnings,* January 2001 to May 2004 (information sector: telecommunications; manufacturing sector: communications equipment); http://data.bls.gov/servlet/SurveyOutputServlet.

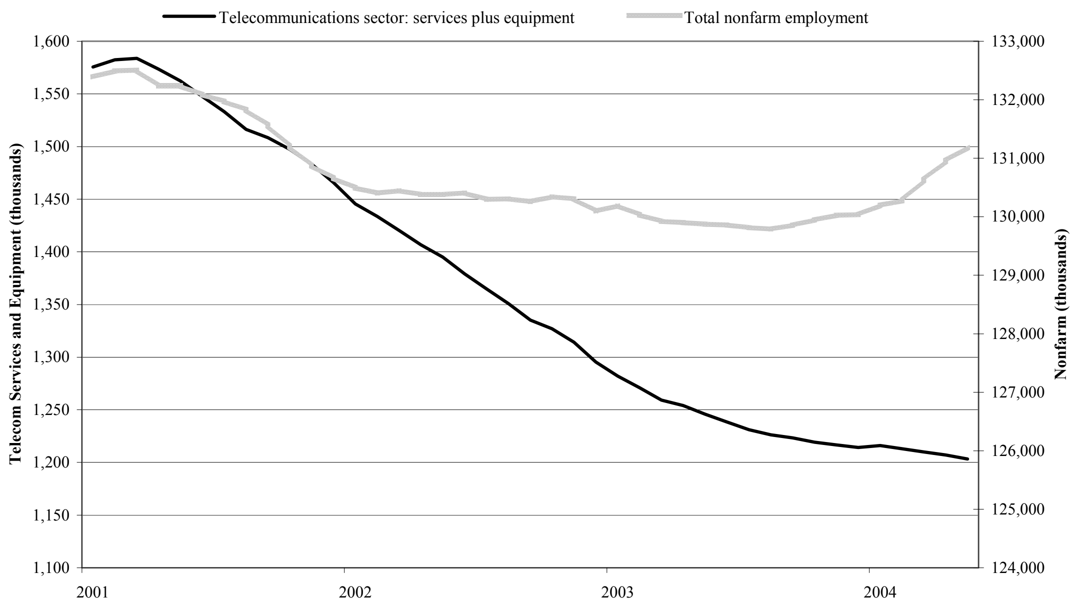
TELECOM SECTOR LAGS ECONOMIC RECOVERY

Today, the U.S. economy is enjoying broad-based growth in jobs and output in virtually every sector *except* telecommunications. Overall employment increased by 1.4 million jobs between August 2003 and May 2004 to reclaim 52 percent of the 2.7 million

91 Bureau of Labor Statistics, *National Employment, Hours and Earnings, January 2001 to May 2004* (2004) (information sector: telecommunications; manufacturing sector: communications equipment; total nonfarm employment); http://data.bls.gov/servlet/SurveyOutputServlet.

jobs lost from January 2001 to August 2003. As Figure III-C shows, however, combined telecom employment fell by a further 23,000 workers. Overall, combined telecom job losses from March 2001 to May 2004 of 380,500 workers make up 28.9 percent of total U.S. jobs lost over this period.

Figure III-C. Telecommunications Sector Employment vs. Total Nonfarm Employment: January 2001–May 2004



Source: Bureau of Labor Statistics, *National Employment, Hours and Earnings, January 2001 to May 2004* (information sector: telecommunications; manufacturing sector: communications equipment; total nonfarm employment); http://data.bls.gov/servlet/SurveyOutputServlet.

As Figure III-D shows,[92] the market capitalization of the telecommunications sector has suffered a dramatic decline relative to the overall stock market since the market decline that began in March 2000. In absolute terms, from March 2000 to July 2004, the market capitalization of the telecommunications service industry declined by 67 percent, or $760 billion, from $1,135 billion to $375 billion. During the same time period, the market capitalization of the equipment makers in the communications technology sector declined 74 percent, or $944 billion, from $1,282 billion to $338 billion.[93] Competitive local exchange carriers were especially hard hit, with a 97 percent decline in market value, from more than $100 billion to just $2.9 billion. After more than

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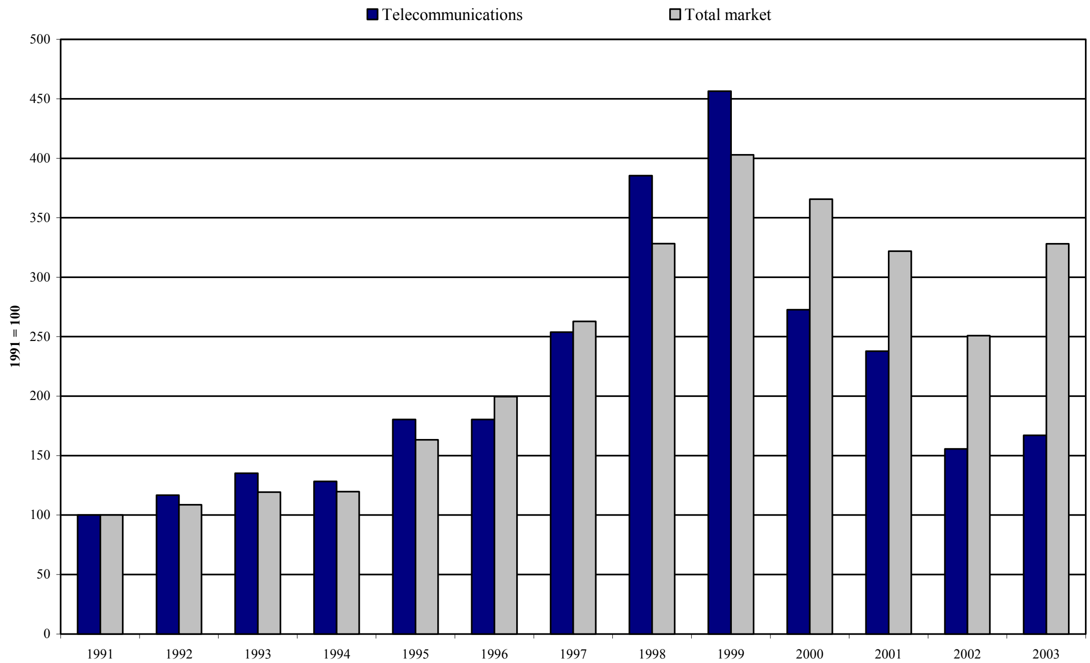
[92] Rutledge Capital calculations (May 2004). *Aggregate Index Sector Total Returns, 3/2000 to 7/2004*, Dow Jones Indexes (2004); http://averages.dowjones.com/jsp/uiHistoricalIndexRep.jsp. *Telecommunications Sector Total Returns 3/2000 to 7/2004,* Dow Jones Indexes (2004); http://averages.dowjones.com/jsp/uiHistoricalIndexRep.jsp.

[93] *Telecommunications Sector Total Returns 3/2000 to 7/2004,* Dow Jones Indexes (2004); http://averages.dowjones.com/jsp/uiHistoricalIndexRep.jsp. *Communications Technology Sector Total Returns, 3/2000 to 7/2004*, Dow Jones Indexes (2004); http://averages.dowjones.com/jsp/uiHistoricalIndexRep.jsp.

$60 billion were spent on new capital between 1996 and 2001, market value in this subsector essentially vanished.[94]

Figure III-D. Index of Market Capitalization of the Telecommunications Sector vs. Total Market: 1991–2003



Notes & Sources: Rutledge Capital calculations (May 2004). Dow Jones, *Periodic Table of Dow Jones U.S. Total Market Economic Sector Asset Class Returns;* http://www.djindexes.com/downloads/xlspages/Ten_Yr_Perf.xls.

Annual capital spending in all areas of telecommunications plummeted. From a peak of $132 billion in 2000, it fell to just $56 billion in 2003. See Figure III-E. The depressing impact of regulations may have been responsible for more than $20 billion of this annual reduction in capital spending.[95]

The dramatic drop in capital spending has caused severe economic damage to a number of related industries, including fiber-optic manufacturing. This spending drop has caused the two major producers of fiber for the United States, Corning and Furukawa Electric, to close five of their six plants. Corning reduced head count by close to 21,000 workers, and Furukawa planned to reduce capacity by more than half.[96] Equipment makers as a group lost 24 percent of their revenues and reduced R&D spending by more than 23 percent.[97]

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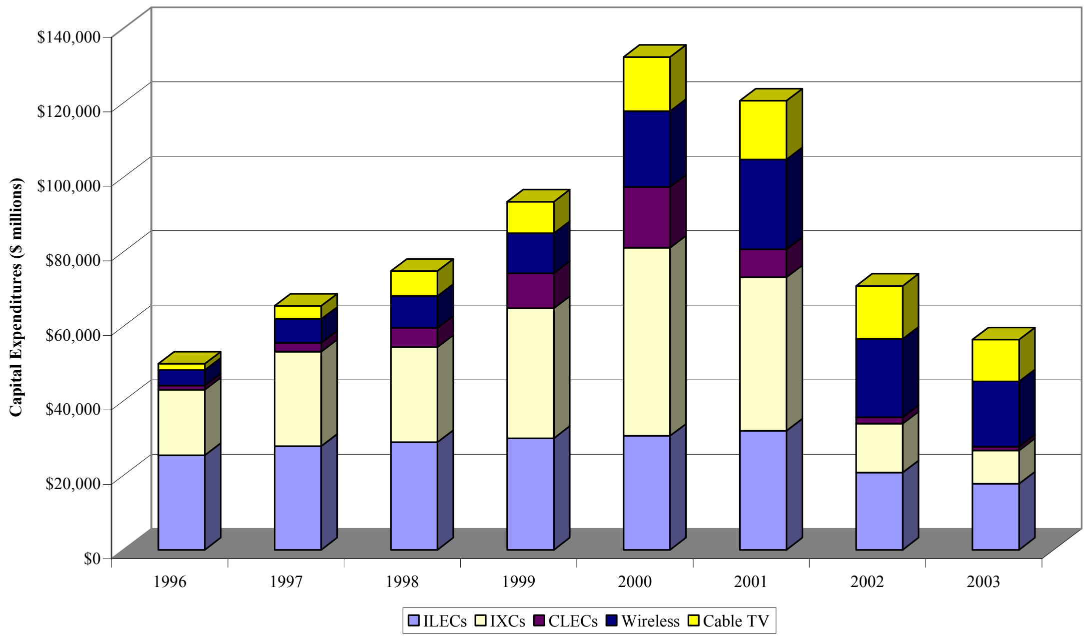
94 As cited in Robert W. Crandall, Allan T. Ingraham, and Hal J. Singer, *Do Unbundling Policies Discourage CLEC Facilities-Based Investment?* 4 TOPICS IN ECON. ANALYSIS & POL'Y 1 (2004).

95 John Haring and Jeffrey Rohlfs, *The Disincentives for ILEC Broadband Investment Afforded by Unbundling Requirements,* STRATEGIC POL'Y RES. (2002), at 15.

96 CORNING, ANNUAL REPORT (2002, 2003); http://www.shareholder.com/corning/mypage.cfm. FURUKAWA ELECTRIC, ANNUAL REPORT (2002, 2003); http://www.furukawa.co.jp/english/ir/financial/annual/index.htm.

97 Rutledge Capital calculations (May 2004). COMPUSTAT Database Research Insight; Standard & Poors CD ROM (Apr. 2004).

Figure III-E. U.S. Telecommunications Service Providers' Capital Expenditures: 1996–2003



Source: T. Rowe Price and Co. reports.

BOOM AND BUST IN TELECOM

The distortions regulations cause do not deserve all the blame for the depressed state of the telecommunications sector. Rather, it was the interaction between telecommunications regulations and the capital markets that led to financial decline. The telecommunications capital market bust since 2000 has had three separate causes. The first was triggered by government rules, pursuant to the Telecommunications Act of 1996, which favored investments in some companies over others. The second cause was the precipitate change in the behavior of bank regulators in late 2000, which resulted in the credit tightening that worsened the recession. The third cause was the sudden shutdown in telecommunications equipment purchases caused by the collapse of prices in the secondary equipment market under the weight of bankruptcy auctions in 2001 and 2002.

Telecommunications Act of 1996

The Telecommunications Act of 1996 led to a new set of rules that inflated expected returns of some businesses, in particular competitive local exchange carriers, and depressed the returns of others, such as the regional Bell operating companies. A vast number of new businesses, eager to take advantage of the artificial disparity in returns, rushed to market with optimistic business plans often showing 20–25 percent sales growth projections. The systematic drying up of future cash-flow streams, which accompanied the reduction of inflation and nominal GDP growth in the years since 1980, has pushed interest rates down and stock multiples up and has made investment managers extremely sensitive to variations in potential revenue growth and in cost of capital when evaluating investments. Bankers and investors flocked to the opportunities created by the new regulatory structure. The flood of capital that poured in caused price/earnings ratios to soar and set the stage for the technology bubble that followed.

The Effect of Constricting Bank Loans

In the fall of 2000, bank regulators at the Treasury Department saw that sales growth was failing to meet expectations for technology companies.[98] The regulators dispatched bank field examiners to shut down bank lending to technology companies and to press banks to attempt to recover loans already made. But the loans that had been made to technology companies proved generally unrecoverable. The companies had used the funds to pay current operating expenses or to buy companies at prices greatly in excess of asset value. The only salvageable assets were the routers, servers, and other information technology (IT) equipment they had recently purchased.

As Figure III-F shows, the unsuccessful attempts of commercial banks to recover technology loans had an unintended consequence: they effectively blocked new loans to all business customers. Aggregate business loans declined steadily from a peak of $1.1 trillion in January 2001 to just $880.1 billion as of June 1, 2004.[99] These loans are important to the future growth of the telecommunications industry. Business borrowers are the small companies targeted as potential customers for high-speed services.

The Effects of Secondary Markets

As telecommunications companies were pushed into bankruptcy, their equipment was auctioned to junk dealers—today we refer to the junkyard as the secondary market—for 20¢ per dollar of original cost. *Fortune* described this tidal wave of "unboxed inventory" being sold in bankruptcy auctions for pennies on the dollar of original cost and called it "Cisco's Worst Nightmare."[100] Figure III-G reproduces estimates of 2002 IT equipment sales as published in the February 4, 2002, article. The secondary market buyers, in turn, sold the product to business customers who would otherwise buy from original equipment makers such as IBM, Cisco, Nortel, Lucent, and Sun at retail prices.

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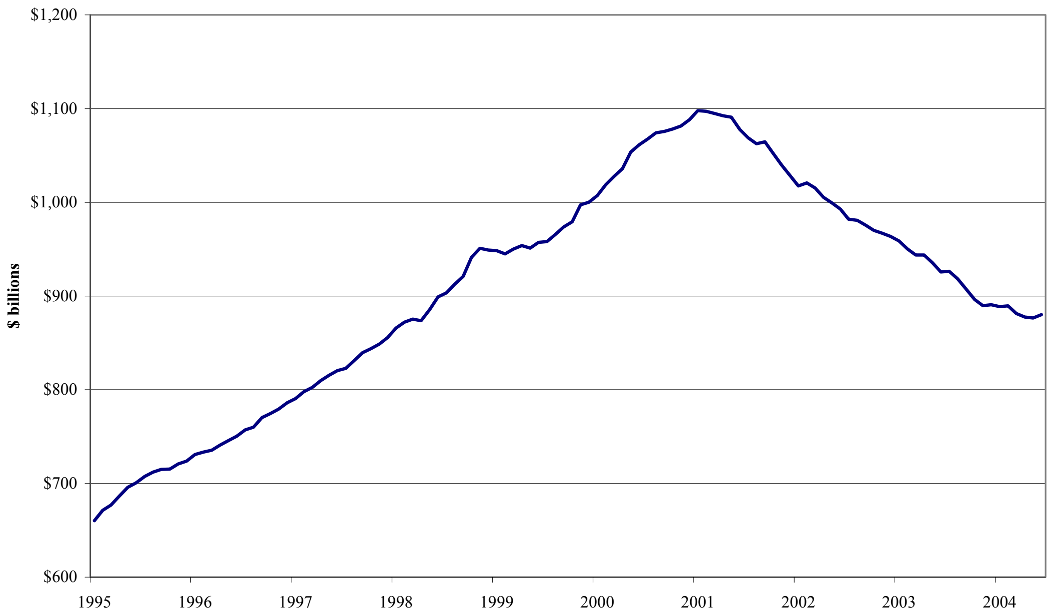
98 John Rutledge, *Credit Crunch Imperils the Economy*, WALL ST. J. (Nov. 6, 2001).

99 Federal Reserve Bank of St. Louis, *Economic Research—FRED II/Banking/Loans (2004)*; http://research.stlouisfed.org/fred2/series/BUSLOANS/10yrs.

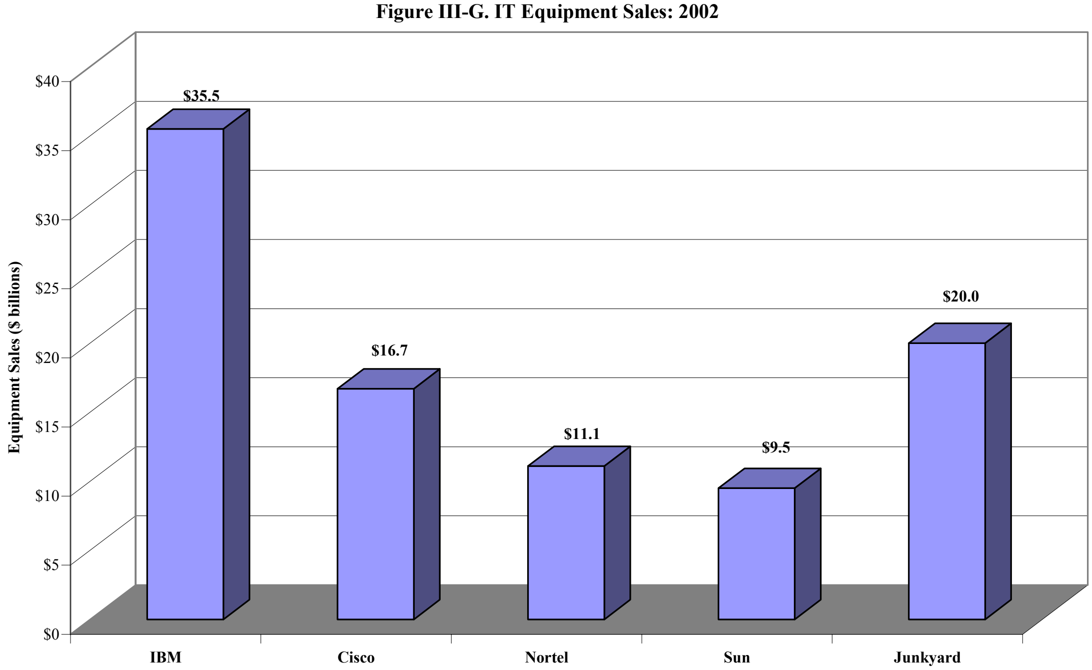
100 J. Creswell, *Cisco's Worst Nightmare (and Sun's and IBM's and Nortel's and ...): Tech's Big Guns Are Waging War with a New Foe: Used-Equipment Sellers,* FORTUNE (Feb. 4, 2002).

Figure III-F. Total Commercial and Industrial Loans Including Foreign Related Institutions: 1995–2004



Source: Federal Reserve Bank of St. Louis, Economic Data, Total Commercial and Industrial Loans Including Foreign Related Institutions; http://research.stlouisfed.org/ fred2/series/TOTCI/100/10yrs.

Figure III-G. IT Equipment Sales: 2002



Source: J. Creswell, *Cisco's Worst Nightmare (and Sun's and IBM's and Nortel's and…): Tech's Big Guns Are Waging War with a New Foe: Used-Equipment Sellers*, FORTUNE (Feb. 4, 2002).

In 2002, the junkyards achieved second place in U.S. IT sales; they trailed IBM but led Cisco. The enormous secondary market volume and low resale prices had devastating effects on the profits of telecom equipment manufacturers.[101] The $20 billion in 2002 junk sales represents approximately $100 billion in lost revenue for primary producers, since auction prices were typically discounted 80 percent from retail value. That loss is big enough to reduce 2002 GDP by almost 100 basis points (a full percentage point) for the year.[102]

Negative Effects of Regulations on Investment

The bubble has burst, but the regulatory structure remains. This has undermined investment incentives of network owners. In particular, regulations have helped to reduce the return on capital for telecommunications service providers[103] below their weighted average cost of capital,[104] as shown in Figure III-H. They have also increased the risk for investors by making telecommunications shares more volatile.[105] Both effects have seriously undermined capital spending in the telecommunications sector, as many researchers have documented.[106] The interaction between the telecommunications sector and the financial markets over the past three years amplified the depressing effects of regulations on investment by reducing output, employment, and productivity for the overall economy.

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101 John Rutledge, *Secondary Markets and the Tech Rebound*, RUTLEDGE INVESTMENT STRATEGIES (2002).

102 GDP in 2002 was $10.5 trillion dollars. Bureau of Economic Analysis, *Gross Domestic Product*; http://www.bea.gov/bea/dn/nipaweb/TableView.asp#Mid.

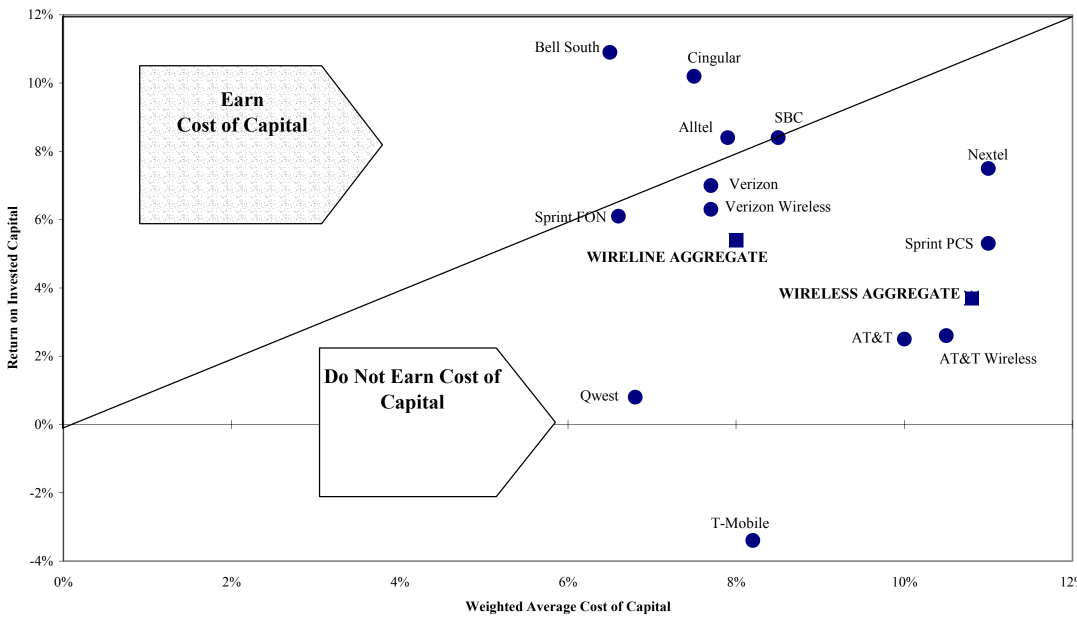
103 The after-tax return on invested capital (ROIC) for telecommunications service firms decreased from a mean of 13.99 percent in 1997 to an average of 7.1 percent for 2001–2003. Rutledge Capital calculations (May 2004); COMPUSTAT Database Research Insight; Standard & Poors CD ROM (Apr. 2004).

104 Companies finance their operations by using a combination of debt and equity. The weighted average cost of capital (WACC) estimates the overall opportunity cost of the mix of capital chosen by a firm. The WACC is estimated by identifying the approximate after-tax cost of each source of financing, then creating a weighted average using the proportions of each source in the total capital structure. The WACC is the required return on capital for the firm as a whole. See, for example, T. COPELAND, T. KOLLER, J. MURRIN, AND MCKINSEY & CO. INC., VALUATION: MEASURING AND MANAGING THE VALUE OF COMPANIES, 3D ED. (John Wiley, 2000).

105 Allan T. Ingraham and J. Gregory Sidak, *Mandatory Unbundling, UNE-P, and the Cost of Equity: Does TELRIC Pricing Increase Risk for Incumbent Local Exchange Carriers?* Criterion Economics (2003).

106 See, for example, Robert W. Crandall and Hal J. Singer, *An Accurate Scorecard of the Telecommunications Act of 1996: Rejoinder to the Phoenix Center Study No. 7,* Criterion Economics (2003).

Figure III-H. Weighted Average Cost of Capital vs. Returns on Invested Capital for U.S. Telecom Carriers: 2002



Source: Raul L. Katz and Carolina Junquiera, *Managerial Strategies and the Future of ROIC in Telecommunications* , Booz Allen Hamilton Working Paper (Mar. 14, 2003).

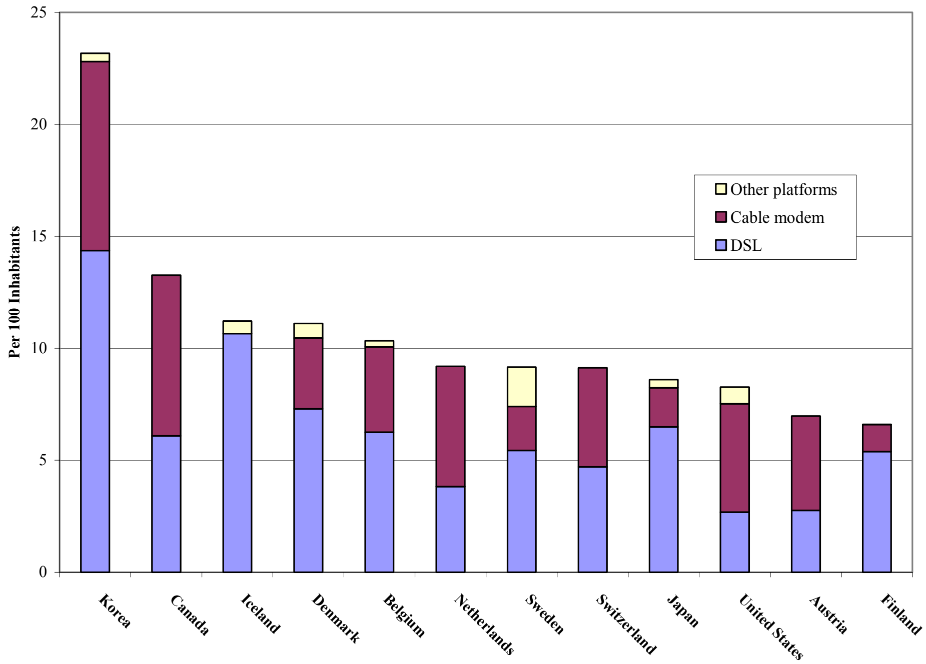
GLOBAL COMPETITIVENESS

Partly as a result of the drop in capital expenditures, the United States lags a number of other countries in access to high-speed telecommunications networks. The United States ranks eleventh globally and tenth in the Organization for Economic Cooperation and Development (OECD)[107] in terms of the number of broadband subscribers per 100 inhabitants.[108] As shown in Figure III-I, South Korea is by far the leader in this field. Hong Kong, Canada, and Taiwan follow by some distance. This level of deployment may yield companies in these countries a competitive advantage over U.S.-based companies in delivering high-value, knowledge-based services to customers both abroad and within the domestic market.

107 Organization for Economic Cooperation and Development, *Broadband Access in OECD Countries per 100 Inhabitants* (June 2003); http://www.oecd.org/document/33/0,2340,en_2649_34225_19503969_1_1_1_1,00.html.

108 Ironically, one of the factors limiting U.S. broadband deployment is the relative high rate of narrowband (dial-up) Internet access. Elsewhere, metered local telephone service makes dial-up access relatively expensive. Congressional Budget Office, *Does the Residential Broadband Market Need Fixing?* (Dec. 2003), at xiv.

Figure III-I. Broadband Access in OECD Countries



Source: Organization for Economic Cooperation and Development, *Broadband Internet Access in OECD Countries: A Comparative Analysis* (Oct. 2003); http://www.oecd.org/document/33/0,2340,en_2649_34225_19503969_1_1_1_1,00.html.

SUMMARY

The U.S. telecommunications industry needs help. The effects of the technology bubble are mostly past us, and the aggregate economy is recovering, but the telecom sector is still mired in difficult economic times. This creates a severe drag on U.S. economic growth, as the telecommunications sector has been a major contributor to growth and productivity across the economy. This connection will become more pronounced as future growth becomes increasingly driven by what Peter Drucker calls "knowledge workers." In particular, he submits that economic growth will come from a "*continuing increase in the productivity of the one resource in which the developed countries still have an edge: ... the productivity of knowledge work and of knowledge workers.*"[109]

Improvements in international telecommunications systems allow professional and technology jobs to be outsourced to Korea, China, and India. Those countries, recognizing the role that communications will play in creating wealth, are increasingly making advanced telecommunications a priority. Investment in high-speed systems makes workers and businesses in Beijing, Seoul, and New Delhi more accessible to global customers. American workers should not be handicapped with inefficient telecommunications rules as they compete in this international contest.

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[109] Peter Drucker, *The Future That Has Already Happened,* FUTURIST MAG. (Nov. 1998), at 16.

IV
EMERGING COMPETITIVE NETWORKS

Many telecommunications networks and applications have developed to compete with incumbent local exchange carriers. New technology has enabled communications networks to deliver multiple services to consumers. To further spur competition and investment in telecommunications, policymakers must end policies that favor one network over another and end price distortions driven by misguided approaches to funding universal service.

*

Separate, competitive networks are emerging across the telecommunications landscape, despite the problems encountered with network-sharing rules. These rival delivery platforms can and do compete with each other in providing voice, high-speed data, and video services. The six platforms are copper wires (owned by local exchange carriers), coaxial cable (owned by cable operators), mobile wireless, fixed wireless, satellite, and broadband over power lines. Some networks, such as the traditional copper telephone plant, have only a single operator providing service in each community, while other networks, such as mobile wireless, have multiple providers competing for customers. In addition to developing physical networks, maturing VoIP applications create "virtual networks" that allow any provider of broadband services to compete in voice, as well as other, product markets.

Technology has rendered the traditional view of *one network, one service*—voice over copper wires, video over coaxial cable—obsolete. Today's world of convergence is rapidly moving communications networks to deliver multiple services to their customers. This transforms complements into substitutes. Originally, the phone wire and the TV cable were bundled to provide two distinct services; now each network seeks to sell the customer a "triple play" package of voice, video, and high-speed data, a new offering that initially brought the alternative platforms into direct rivalry.

Other networks can, and do, provide pieces of this package. Cellular operators supplying wireless voice service generate revenues nearly equal to those of fixed-line local exchanges; satellite TV providers serve over 20 million households and are growing rapidly as established cable companies now lose subscribers, year after year. Entirely new networks hope to form, such as a national fixed wireless system that cellular pioneer Craig McCaw is now organizing[110] and a technology to deliver broadband over power lines. Even when a novel delivery system does not compete across the entire product space, its entry into one segment can disrupt markets and provoke enormous change.

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110 Jeff Bounds, *Telecom Billionaire Craig McCaw Snaps Up Clearwire Holdings, Eyes "ITFS" Space,* DALLAS BUS. J. (Apr. 16, 2004).

Take satellite television. When two operators (DirecTV and Echostar) began offering competitive video service (in 1994 and 1996), the development spurred cable TV service providers to revamp operations. Starting in the late 1990s, substantial capital upgrades have been increasing bandwidth and digitalization of systems. While the immediate goal was to better fend off the competitive foray of satellite video, which offered many more channels and broadcast in a higher-quality digital format, cable systems found that their new, improved architecture could efficiently provide two-way Internet access. Cable modem service became the broadband market leader, a result defying industry experts. This, in turn, provoked local telephone carriers to intensify their rollout of phone-line broadband, DSL.

This chain reaction continues to ignite competitive fires. Today, phone companies are aligning with satellite TV operators to offer "triple play" packages, with phone-line delivery of voice and DSL, alongside satellite video.[111] In the second quarter of 2004, phone carrier SBC added about 365,000 new DSL customers, about 100,000 of which were bundled with DirecTV's video service. The competitive dynamics brought phone companies into the triple-play space, even if their networks were not well equipped to deliver every service.[112] A price war erupted in mid-2004, with Cablevision (a New York–based cable operator with about 3 million subscribers) offering its "Optimum Triple Play," consisting of a large bundle of cable TV program networks, unlimited domestic calling, and cable modem service, for $90 per month—"a discount that takes dead aim at Verizon by essentially giving away unlimited phone service for free."[113]

The heat promises to intensify if Internet-based technologies achieve their promise, a question that is now largely in the hands of regulators. With the development of VoIP and other Internet protocol (IP) applications (such as video), virtually any broadband connection can be used to deliver any one of the triple-play components. This is driving entrepreneurial investments in mobile wireless (third-generation) broadband, fixed wireless, broadband delivered by satellite, broadband delivered by power lines, competitive broadband service providers, and other advanced data delivery systems.

Figure IV-A depicts some of the many telecom networks available to most homes in the United States today. Utility poles and underground conduits carry the telephone company's copper wires that offer POTS and DSL. Following a parallel path is the cable TV operator's coaxial cable delivering video, broadband data, and, in some cases, voice.

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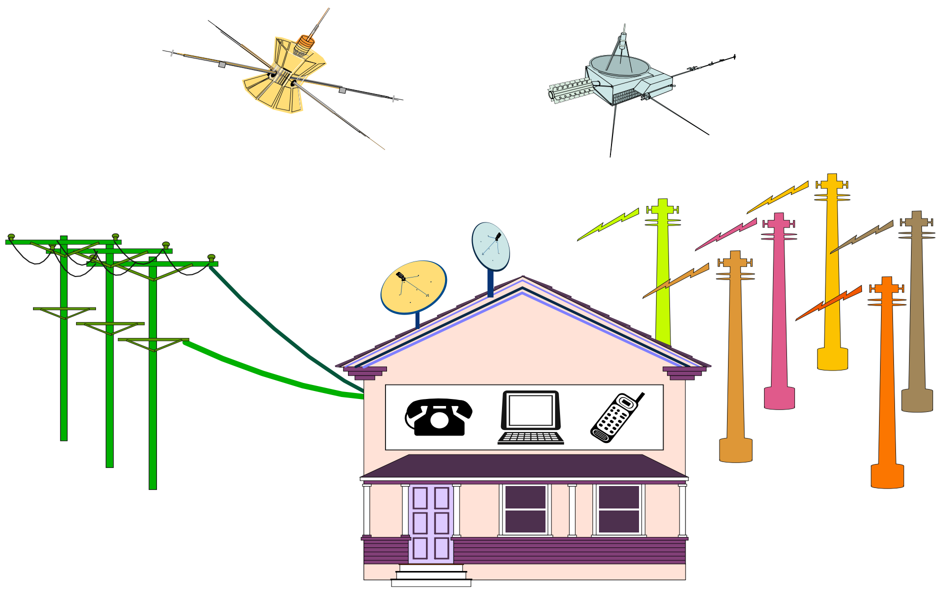
111 SBC, *SBC, Echostar Announce Strategic Marketing Alliance* (Apr. 17, 2002); http://www.sbc.com/gen/press-room?pid=4800&cdvn=news; DirecTV, *BellSouth and DIRECTTV Announce Agreement to Sell Digital Satellite Television Service as Part of BellSouth Answers Bundle* (Aug. 27, 2003); http://www.directv.com/DTVAPP/aboutus/headline.dsp?id=08_27_2003A; Verizon, News Release, *Verizon Adds DIRECTV Programming, Creating the Most Comprehensive, Top-Quality Service Bundle in the Market* (Jan. 29, 2004); http://newscenter.verizon.com/proactive/newsroom/release.vtml?id=83533&PROACTIVE_ID=cecdcacccbcac7cdcec5cecfcfcfc5cececacbcec7cccbcaccc5cf.

112 Jeff Baumgartner, *SBC to Pump Billions into IP Triple-Play Strategy*, CED BROADBAND DIRECT; http://www.cedmagizine.com/cedailydirect/2004/0604/cedaily040622.htm.

113 *Cablevision Takes Aim at Verizon with Price Cuts*, USA TODAY (June 21, 2004). Verizon owns the largest local telephone network in Cablevision's service territory.

Consumers have two competing satellite options, each of which offers high-speed Internet downloads. Despite the seriously limited spectrum that is currently allotted, six national mobile wireless providers offer each home additional voice and, increasingly, broadband data choices.[114]

Figure IV-A. Competitive Telecommunications Pathways to the U.S. Household



Real-time events are drawing new last-mile connections that do not appear in Figure IV-A. VoIP makes voice just another data application that can be delivered over twisted-pair copper, coaxial cable, or other broadband connections. Allotting additional spectrum to mobile phones would lead to more mobile broadband and new fixed wireless networks. BPL could offer another data pipe. Ultimately, fiber optics may be extended from neighborhood nodes (where they go in many cable and telephone networks today) to residential premises, providing virtually unlimited bandwidth.

We describe these competing networks to show how technological convergence is enabling them to deliver multiple services to consumers.

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[114] The Department of Justice and the Federal Communications Commission are now evaluating a proposed merger between two of the six operators (Cingular and AT&T Wireless).

COPPER LOOP

Telephone networks have long consisted of a twisted pair of copper wires (the local loop), connected to a switch at a central office, from which point traffic was routed back into the loop or transported to distant nodes. The network was designed to provide circuit-switched voice service where the connection between telephones is always held open to provide a continuous communication channel. Services such as caller ID or voice-mail were added by upgrading equipment or software in central offices.

Voice communications use only a small portion of the transmission capacity of the copper loop. In the late 1990s, telephone companies began to deploy DSL technology, where the unused portions of the copper wire adjacent to the voice circuit are used to transmit data packets, providing a broadband connection. In packet-switched architectures, digital information is broken into small units that are transmitted and reassembled at the receiving end. No traffic travels over an exclusive channel. (The Internet is the standard example of a packet-switched network.) Broadband connections provide numerous services, including access to the World Wide Web and VoIP.

COAXIAL CABLE

Cable systems deliver video, broadband, and, sometimes, voice services to homes over wires. Coaxial cables are the primary conduit, high-capacity copper wires with shielding to allow transmission of radio frequencies—"spectrum in a tube"—without intermingling signals with wireless radio emissions. Distribution grids collect signals (using satellite downlinks, over-the-air antennas, microwave receivers, or fiber-optic links) at a head-end and then distribute this large package (consuming generous bandwidth) to neighborhood nodes via fiber-optic lines. Nodes usually serve between 100 and 1,000 homes. From there, coaxial cable connects end-users.[115]

Cable systems began in the United States in the late 1940s but were greeted with hostile regulations in the early 1960s when, instead of simply extending broadcast TV signals to areas without adequate reception, operators began wiring major cities to compete with broadcasters.[116] With deregulation in the late 1970s, however, cable systems won the right to offer desirable programming and soon wired the country for service. By 1988, more than half of U.S. households subscribed; by 2002, more than half of all audience viewing was of cable network programs, rather than broadcast TV. Cable TV then attracted its own rivals, as two direct broadcast satellite (DBS) television systems launched service in 1994–1996. Industry insiders referred to the threat in dire terms—"the Deathstar."[117] Satellite garnered about 22 percent of multichannel video subscribers by 2003. See Table IV-A.

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115 Thomas W. Hazlett, *Cable Television*, in MARTIN CAVE ET AL., EDS., 2 HANDBOOK OF TELECOMMUNICATIONS ECONOMICS (North Holland, forthcoming).

116 Robert W. Crandall and Stanley M. Besen, *The Deregulation of Cable Television*, 44 LAW & CONTEMP. PROBS. (Winter 1981).

117 Stephen Keating, CUTTHROAT: HIGH STAKES AND KILLER MOVES ON THE ELECTRONIC FRONTIER (Johnson Books, 1999), at 125.

Table IV-A. Competing Video Delivery Technologies (% of MVPD Households Served): 1993, 1998, and 2003

	1993	1998	2003
Cable	94.89%	85.34%	74.87%
DBS	0.12%	9.40%	21.63%
Other MVPDs	4.99%	5.26%	3.50%

Note & Source: MVPD = multichannel video programming distributor. Federal Communications Commission, *Tenth Annual Report in the Matter of Annual Assessment of the Status of Competition in the Market for the Delivery of Video Programming*, MB Docket No. 03-172 (2004), Table 7.

Policymakers have not imposed regulations comparable to the wholesale access rules for local telephony on U.S. cable systems. Congress and the FCC have determined that cable companies are not common carriers.[118] DBS companies entered the cable market by creating new distribution systems requiring large upfront capital outlays. And when cable companies saw satellite operators take market share by using high-quality, all-digital delivery systems with far more channels, they invested aggressively to confront the competitive challenge provided by satellite operators.[119]

Cable Modem and DSL Competition

As seen in Figure IV-B, the cable industry aggressively increased capital expenditures in 1999 and spent over $65 billion up through 2003. This risky investment, while no doubt encouraged by favorable conditions in capital markets in 1999–2000, survived the bursting of the stock market bubble. Cable operators transformed the typical pre-1999 analog, 64-channel, 450 MHz system architecture into a two-way, digital, 750 MHz system. The new architecture not only could economically deliver more channels—at least 200, depending on how spectrum is allocated between analog and digital packages—but could offer interactive services such as video-on-demand, telephony, and high-speed Internet access. Figure IV-C shows the growing availability of cable modem service.

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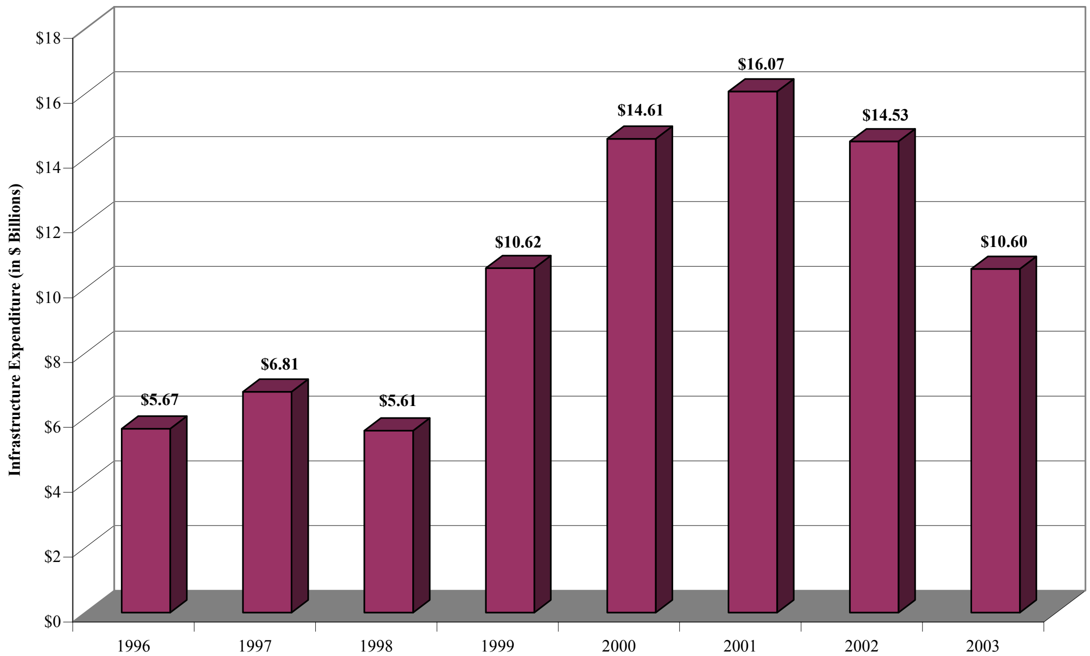
118 Policymakers inserted explicit determination of this issue in the Cable Communications Policy Act of 1984 (47 U.S.C. § 541(c) (2002)) and again in the Telecommunications Act of 1996 (61 47 U.S.C. § 571 (2002)). Nonetheless, they levied some carriage requirements on operators, including the obligation to carry local broadcast TV programming and to provide certain public, educational, or government programming. In practice, these mandates are exceedingly modest compared with the risk associated with broader "open access" rules. See Thomas W. Hazlett and George Bittlingmayer, *The Political Economy of Cable "Open Access,"* 4 STAN. TECH. L. REV. (2003); http://stlr.stanford.edu/STLR/Articles /03_STLR_4.

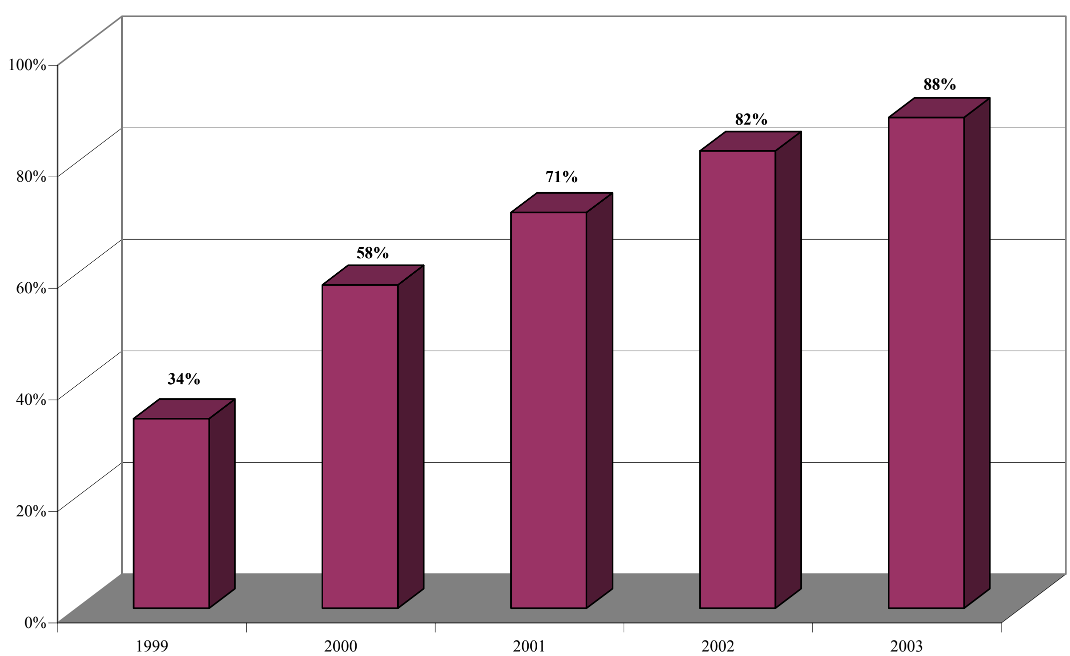
119 Congressional Budget Office, *Does the Residential Broadband Market Need Fixing?* (Dec. 2003), at 25.

Figure IV-B. Capital Expenditures by U.S. Cable Operators: 1996–2003



Source: National Cable and Telecommunications Association; http://www.ncta.com/Docs/PageContent.cfm?pageID=314.

Figure IV-C. Cable Modem Availability (% of Homes Passed by Cable): 1999–2003



Sources: Morgan Stanley, *What Does the Market Expect?* (Apr. 8, 2004); http://www.ncta.com/Docs/PageContent.cfm?page ID=316.

Cable companies invested in these upgrades to fend off satellite rivals. But these enhanced capacities produced strong incentives for cable operators to enter additional markets. In residential broadband, cable operators succeeded not only to challenge local exchange carriers, but—as *Fortune* recently put it—to "trounce DSL in the broadband arena."[120] This observation stems from cable modems' market share, in excess of 60 percent, against DSL and other residential high-speed access providers.[121] In response, phone companies appeared to step up their efforts to provide DSL service.[122]

Broadband Service Providers

A combination of strong demand and reduced capital costs led new cable TV providers to enter local markets with their own infrastructure in the late 1990s. Several firms were capitalized to provide new competitive networks. They offered consumers lower prices with the original "triple play" bundles. This brought broadband service providers (BSPs, formerly called overbuilders) into direct competition with both cable and telephone incumbents.

BSPs have provided substantial benefits to consumers. A February 2004 study by the General Accounting Office[123] (now the Government Accountability Office) found that head-to-head cable competition reduced prices in selected markets by 15–41 percent, discounts over and above those associated with satellite TV competition (which exists both in overbuilt and nonoverbuilt markets).[124] Results have been less positive for investors. Financial markets have withdrawn their willingness to invest in such ventures, and leading BSPs—including RCN,[125] Knology, and Wide Open West—have reorganized under bankruptcy laws.

Yet many BSPs are still operating and by year-end 2003 were serving about 1.4 million subscribers. Given that the FCC estimates that the companies average a penetration rate (subscribers-to-homes-passed ratio) of 25 percent, about 6 million households enjoy substantial competitive benefits. If the average retail discount from

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120 Stephanie N. Mehta, *King Comcast; Brian Roberts Rules the Biggest Cable Company in the Country; Now, with the Pending Sale of QVC, He's Stronger Than Ever. So What's He Going to Do with All That Power?* FORTUNE (July 21, 2003), at 70.

121 Legg Mason, *2003: A Banner Year for Broadband as DSL Gains Momentum* (Mar. 5, 2004), at 5.

122 At the end of 1997, one industry trade publication noted that DSL deployment had been very slow but commented: "There are, however, competitive forces at work that might light a fire under the regional Bells in 1998. For one, the carriers may see some competition from cable TV operators. The cable industry is starting to address some of the shortcomings of its infrastructure." Saroja Girishankar, *DSL Options Coming from Carriers, ISPs*, INTERNET WEEK.COM (Dec. 31, 1997); http://www.internetweek.com/news/news1231-1.htm.

123 General Accounting Office, *Wire-Based Competition Benefited Consumers in Selected Markets,* GAO-04-241 (Feb. 2004). The lower prices reported obtained in five of the six market pairs studied. Overbuilt cable markets were matched with similar markets without overbuilt competition.

124 General Accounting Office, *Issues Related to Competition and Subscriber Rates in the Cable Television Industry,* GAO-04-8 (Oct. 2003).

125 RCN filed for bankruptcy on May 27, 2004. Chris Nolter, *RCN Sinks into Ch. 11*, THEDEAL.COM (May 28, 2004).

overbuilding is just 10 percent, which is at the low end of estimates, then the annual consumer savings exceed $250 million.[126]

While passing only a few percent of total U.S. homes, overbuilders demonstrate what is possible when capital investment creates new network infrastructure. One observation is that rules that allow profitable provision of ancillary services—such as multichannel video—have very important indirect impacts on the ability of markets to offer competitive telephony services. This, of course, stems from strong economies of scope—cost savings realized when one company offers multiple products (cable and then telephony) via the same platform. The emergence of BSPs underscores the extent to which telecommunications policies are interrelated and the degree to which rules opening one market to competition can strongly promote competition elsewhere.

SATELLITES

Direct broadcast satellite carriers are important both because they operate their own video distribution networks in competition with established cable providers and because these firms have triggered competitive dynamics with far-reaching benefits. In multichannel video, DBS market share is now approaching 25 percent.[127] For the first time since the birth of cable in the 1950s, the number of households subscribing to cable has declined with an estimated loss of 900,000 U.S. subscribers in the past two years. Industry analysts suggest: "For an explanation … cable executives need only look to the sky: The satellite industry has grown from virtually zero 10 years ago to about a quarter of all U.S. homes that pay for TV."[128] As discussed, DBS is also credited with prompting cable TV incumbents to upgrade systems, a measure that has stimulated residential broadband deployment. Currently, telephone companies are forming alliances with satellite TV carriers to respond to cable TV system bundles. BellSouth, SBC, and Verizon have each entered partnerships with satellite systems to sell video channels to their telecom customers.[129] In the course of this rivalry, customers receive substantially more communications services at heavily discounted per-unit rates.

Satellite providers are also able to deliver broadband Internet access to households and businesses. The FCC reports that DirecWay, DirecTV's broadband service, enlisted about 166,000 subscribers as of mid-2003.[130] In addition, thousands of

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[126] Assuming that cable subscribers pay an average of $45 monthly, a 10 percent discount equals $4.50. If 80 percent of households in BSP markets subscribe (somewhat higher than average owing to lower rates and greater competition), annual consumer gains are approximated by: $4.50 X 6,000,000 X 12 X 0.8 = $259,200,000.

[127] See Table IV-A.

[128] Peter Grant, *Cable Trouble: Subscriber Growth Stalls as Satellite TV Soars*, WALL ST. J. (Aug. 4, 2004), at 1.

[129] Marguerite Reardon, *Rumble in the "Triple Play" Jungle*, CNET NEWS.COM (June 21, 2004); http://news.com.com/2100-1037-5242738.html. See also Peter Grant, *Cable Trouble: Subscriber Growth Stalls as Satellite TV Soars*, WALL ST. J. (Aug. 4, 2004), at 2.

[130] Federal Communications Commission, *Tenth Annual Report in the Matter of Annual Assessment of the Status of Competition in the Market for the Delivery of Video Programming*, MB Docket No. 03-172 (2004), at 52.

business customers, both domestic and international, use satellite for high-speed data connections.

Two issues quickly arise with satellite broadband. Latency was noticeably problematic when long-distance phone connections were provided via satellite, a situation remedied by moving these links to fiber-optic lines. In many applications, including standard video entertainment and most residential Internet use, microsecond transmission pauses are not troubling. (They are noticeable only in certain types of interactive applications, in fact.) The more important constraint arises from the limited radio spectrum allocated to satellite services, which restricts the number of DBS operators that can enter the market. Spectrum capacity and orbital slots can be increased with beam-focusing technologies that reuse frequencies, in much the same way that (terrestrial) cellular phone providers reuse bandwidth from cell to cell.

Yet licensing constraints have limited entry into satellite TV markets and thus have reduced both competitive pressure and operators' capacity. In April 2002, SES AMERICOM, a subsidiary of SES Astra, a leading European provider of satellite video and broadband services, petitioned the FCC for permission to offer direct-to-home video and broadband satellite service in the United States.[131] Regulatory barriers were

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[131] SES AMERICOM described its plans in this release:

> Dean Olmstead, President and CEO of SES AMERICOM, speaking today at the Satellite Entertainment 2002 conference in Monterey, California, said: "These television services will be provided via a new satellite that we intend to launch into the 105.5° West Longitude orbital slot. Another new SES AMERICOM satellite, at the adjacent 105° W.L. slot, will enable us to provide high-speed broadband connections to U.S. residences. All of these services—TV and broadband—will be available to U.S. consumers who purchase a single, small satellite dish and related equipment, into which the latest two-way digital technologies will have been incorporated."
>
> SES AMERICOM intends to offer the new platform, named AMERICOM2Home®, using a license granted to its affiliate by the Government of Gibraltar, relating to an orbital location over the United States at 105.5¼ W.L. This slot falls directly between orbital positions used by DirecTV and EchoStar at 101¼ and 110¼, respectively. Both AMERICOM2Home® and the existing satellites use frequencies in the 12.2-12.7 GHz range, which is set aside internationally for direct broadcasting to the home. SES AMERICOM also holds FCC licenses for both Ku-band and Ka-band satellites at the 105¼ W.L. location.
>
> Olmstead explained that the new AMERICOM2Home® system will be different from the current satellite television services offered by EchoStar and DirecTV. Unlike these providers, SES AMERICOM itself will not offer any retail services to consumers. Instead, Olmstead explained, "We will create a best-in-class DBS satellite platform, on which we expect a wide variety of content providers—large and small, established and start-up, mass market and niche, advertising-supported and pay-per-view—will lease capacity in order to offer their programs and interactive entertainment directly to American consumers."

SES AMERICOM, Press Release, *SES AMERICOM Files FCC Petition for New Satellite Television and Internet Platform* (Apr. 25, 2002); http://www.ses-americom.com/media /2002/04_25_02.html.

substantial, however. In March 2003, SES AMERICOM shifted course and entered a partnership with DBS incumbent EchoStar that leased its Gibraltar-based satellite capacity in a long-term agreement.[132] Such regulatory barriers create serious impediments to expanding broadband and video competition.[133]

MOBILE WIRELESS NETWORKS

The cellular telephone duopoly ended with entry by personal communications services and specialized mobile radio (SMR) licensees. In a proceeding formally initiated in 1990, the FCC allocated 120 MHz to six new PCS licenses in the 1.9 GHz band. In a series of auctions in 1994–1996, PCS bidders were able to aggregate permits to create regional or national service territories.

PCS licensees began constructing competing wireless telephone systems just as Fleet Call, now Nextel, was deploying a nationwide wireless network using SMR licenses. Nextel used licenses originally dedicated for local dispatch services (taxis and pizza delivery). A regulatory waiver allowed Nextel to offer standard telephone calls over the allocated frequencies.[134]

By 2001, six national networks—AT&T Wireless, Cingular (a joint venture of SBC and BellSouth), Nextel, Sprint PCS, T-Mobile, and Verizon Wireless—emerged. They served about 85 percent of U.S. subscribers. No other industrialized country supports more competing networks.[135] This rivalry has resulted in a sharp decline in wireless telephone charges, with the average price per minute of use declining 79 percent between 1993 and 2002.[136] In response, usage has increased more than *twentyfold* during this period.[137] Intense competitive pressure has made profits elusive, a situation investment analysts describe as "profitless prosperity."[138]

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[132] Federal Communications Commission, *Tenth Annual Report in the Matter of Annual Assessment of the Status of Competition in the Market for the Delivery of Video Programming*, MB Docket No. 03-172 (2004), at 52.

[133] Similar entry barriers defeated the efforts of Northpoint Technology to rival incumbent cable and satellite carriers. See Thomas W. Hazlett, *Entrepreneurs Need Not Apply*, FIN. TIMES ONLINE (Jan. 15, 2004); http://news.ft.com/servlet/ContentServer?pagename=FT.com/StoryFT/FullStory&c=StoryFT&cid=1073281062488&p=1012571727285.

[134] A former FCC attorney, Morgan O'Brien, provided the entrepreneurial vision driving Nextel. See Thomas W. Hazlett, *The Wireless Craze, the Unlimited Bandwidth Myth, the Spectrum Auction Faux Pas, and the Punchline to Ronald Coase's "Big Joke": An Essay on Airwave Allocation Policy,* 14 HARV. J.L. & TECH. 335 (2001), at 426–28; http://jolt.law.harvard.edu/articles/pdf/14HarvJLTech335.pdf.

[135] Thomas W. Hazlett, *Is Federal Preemption Efficient in Cellular Phone Regulation?* 56 FED. COMM. L.J. (Dec. 2003), at 169.

[136] Cellular Telecommunications Industry Association, *CTIA's Semi-Annual Wireless Industry Survey Results, June 1985–December 2003*; http://files.ctia.org/img/survey/2003_endyear/752x571/SEMI-A2.jpg.

[137] Cellular Telecommunications Industry Association, *CTIA Semi-Annual Data Survey Results Book 1985–2003* (Nov. 2003), at 217–18.

[138] S. Flannery et al., *Wireline Telecom Services: 3Q02 Preview*, MORGAN STANLEY, DEAN WITTER (Oct. 16, 2002), at 27. See also Figure III-A.

Each wireless network comprises about 20,000 base stations, which constitute the electronic hub of each cell. Base stations feature antennas to send and receive signals to and from subscribers with hand-held units; signals received are then sent on high-capacity conduits to the phone call's destination. Since cellular service began, about $150 billion in capital has been invested in creating U.S. wireless telephone infrastructure.[139] In 2003, about $90 billion in revenue was generated from approximately 150 million subscribers, who used over 800 billion minutes of airtime.[140]

The success of mobile telephony in the United States is striking considering the limited amount of radio spectrum available to the industry. The United States allocates approximately 170 MHz to mobile phone services. This is approximately 100 MHz less than countries of comparable income levels. See Figure IV-D. This regulation-imposed constraint (abundant underutilized spectrum could be allocated to licenses and sold at auction to competing bidders) costs the U.S. economy substantial sums in lost consumer surplus. More directly relevant to the analysis of local telephone competition, allocated spectrum would lower per-minute rates for wireless phone use and expand wireless broadband connectivity. These networks, already provided by multiple competitors, offer close substitutes to services provided by incumbent local exchange carriers. By misallocating a vital input, regulators greatly hinder telecommunications policy goals.

Fixed Wireless

Fixed wireless systems use radio waves to make a broadband connection between two stationary points. Firms employ a variety of technologies and transmit over a few feet or a few miles, using proprietary or open standards, on either licensed or unlicensed frequencies. Considerable interest is being shown in systems being developed internationally, generically called fourth-generation. The Arraycomm iBurst system, sold by Vodaphone in Australia, delivers high-speed (1 MBPS) service to mobile users. IP Wireless's New Zealand system uses a different wireless technology to provide similar high-speed access, with costs of just $30 per month. About 5 million wireless broadband customers in South Korea use Qualcomm's EV-DO technology. Craig McCaw's Clearwire venture is attempting to establish a national fixed wireless broadband option throughout markets in the United States by using frequencies in the 2.5 GHz band.

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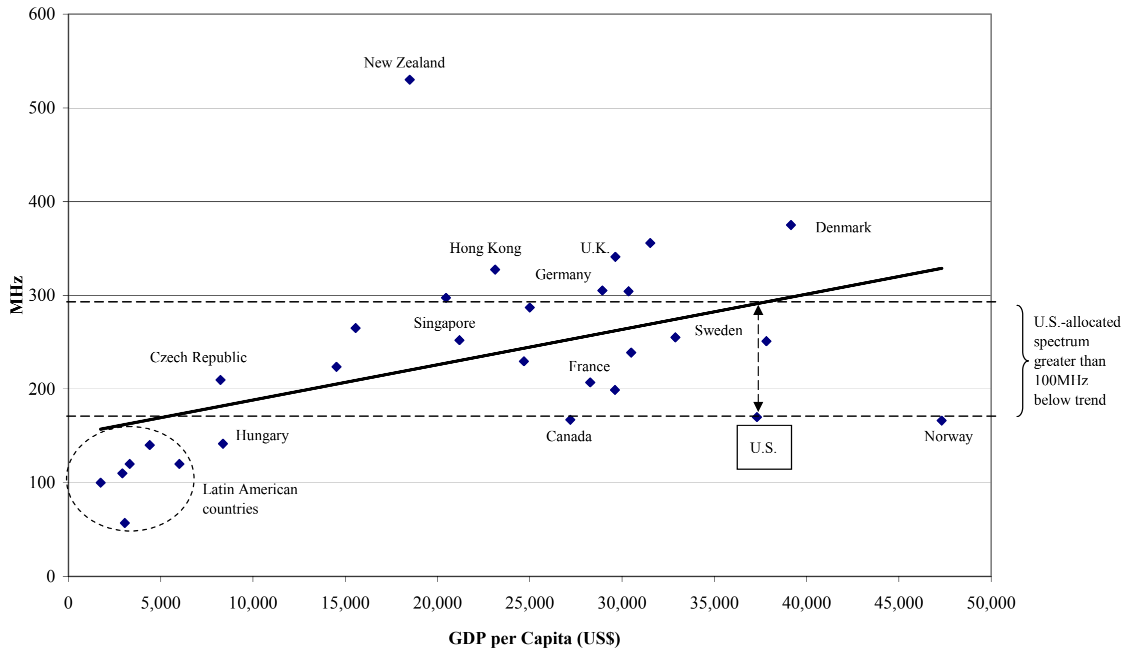
139 Cellular Telecommunications Industry Association, *CTIA's Semi-Annual Wireless Industry Survey Results, June 1985–December 2003*; http://files.ctia.org/img/survey/2003_endyear/752x571/Annual_Table_Dec_2003.jpg.

140 Cellular Telecommunications Industry Association, *CTIA's Semi-Annual Wireless Industry Survey Results, June 1985–December 2003*; http://files.ctia.org/img/survey/2003_endyear/752x571/Revenues_Dec03.jpg and http://files.ctia.org/img/survey/2003_endyear/752x571/MOU_Dec03.jpg.

Figure IV-D. Spectrum vs. GDP per Capita



Source: Thomas W. Hazlett and Roberto Muñoz, *A Welfare Analysis of Spectrum Allocation*, Manhattan Institute for Policy Research (June 10, 2004).

BROADBAND OVER POWER LINES

Broadband over power lines may become an additional broadband rival. BPL sends digital information over the wires used to transport electricity around cities and into homes.[141] After years of efforts to overcome technical difficulties, the first commercial rollout of BPL occurred in Spring 2004, under the auspices of Cinergy in Cincinnati.[142] All participants in the telecommunications industry will follow the developments.

BPL sends radio waves through electric wires in a way that is similar to how DSL and cable modems use copper phone wires and coaxial cable. The technology uses medium voltage lines to transport data to neighborhoods. In some networks, lower voltage lines then transport the data into households. In others, fixed wireless links connect neighborhood nodes to homes.

Of course, electric wires were not designed to be conduits for radio frequencies. Consequently, radio signals can both enter the wire and interfere with the BPL signal and bleed out of the electric wires, interfering with wireless radio signals. Advanced technologies have adapted BPL to avoid the first problem. Signal interference with radio

141 A second application of BPL that uses the internal electric wiring of a house to transport data around a house is called in-house BPL. It can, for example, extend a phone network or create a local area network (LAN).

142 Bob Gibson, *Broadband over Power Lines: Can It Deliver on Its Promise in Rural America?* 45 MGMT. Q. (Apr. 1, 2004). *Cinergy to Offer Broadband Services over Power Lines,* 29 ENERGY USER NEWS (Apr. 1, 2004).

systems is more controversial. Amateurs and ham radio operators raise concerns about BPL systems' ability to comply with noninterference rules.[143] The FCC has proposed creating rules specific to BPL. While the FCC's proposals seem to limit conflicts between BPL and other radio users, delays and regulatory uncertainty could undermine investment incentives to develop this emerging telecommunications alternative.

VoIP: The Network Independent Service[144]

The first half of 2004 saw a marked increase in a new voice telephone service delivered over the Internet, called voice over Internet protocol.[145] One company, Vonage, has now signed up more than 200,000 VoIP customers.[146] Skype, a software application that allows two PC-connected users to talk over broadband connections without any incremental charge, has been downloaded over 17 million times.[147] Many other suppliers offer various VoIP services nationwide.[148] Traditional cable companies like Comcast, Time Warner, Cablevision, and Cox and telecommunications services firms like AT&T and Qwest are also entering the market.[149] A key question is how regulators will respond.

VoIP has the potential to put further downward pressure on telecommunications prices, and this threatens to erode subsidies for universal service, a policy concern we address at the end of this section. Because taxes on traditional telephone service fund the subsidies, regulators may view reducing revenues through price competition as *too much market rivalry*. See Table IV-B for a sample of current VoIP offerings.

VoIP delivers consumers different levels of service quality. The largely unregulated wireless phone market has revealed that different consumers have different preferences over quality. Some are willing to pay for higher levels of quality (in terms of voice quality, size of network, and/or dropped calls), while others are not. The fact that

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143 Federal Communications Commission, *Notice of Proposed Rulemaking in the Matter of Carrier Current Systems, Including Broadband over Power Line Systems* (ET Docket No. 03-104) and *Amendment of Part 15 Regarding New Requirements and Measurement Guidelines for Access Broadband over Power Line Systems* (ET Docket No. 04-37), FCC 04-29 (Feb. 23, 2004).

144 Robert W. Hahn helped write this part of the report, which draws from earlier work by Robert W. Crandall, Robert W. Hahn, Robert E. Litan, and Scott Wallsten, *Why the Government Should Not Regulate Internet Telephony,* AEI-BROOKINGS JOINT CENTER FOR REGULATORY STUDIES REGULATORY ANALYSIS 03-12 (Dec. 2003).

145 *If You Can't Beat 'em, Join 'em*, ECONOMIST (Dec. 20, 2003). For instance, Vonage offers VoIP by touch-tone, corded, or cordless phone, while Skype offers VoIP services via personal computer. *What Is VoIP?*; www.vonage.com/help_voip.php. Bruce Bahlmann, *Broadband VoIP: Skype, Vonage, Net2Phone, etc.*, BROADBAND PROPS. (Mar. 2004).

146 Vonage, *Vonage® Activates 200,000th Line: First Broadband Telephony Provider to Reach 200,000 Line Milestone* (July 13, 2004); *Gallup Survey Highlights VoIP Potential,* UBS INV. RES. (Apr. 8, 2004), at 2; http://www.vonage.com/media/pdf/res_04_08_04.pdf.

147 Skype Homepage; http://www.skype.com.

148 *If You Can't Beat 'em, Join 'em,* ECONOMIST (Dec. 20, 2003). Qwest, *Qwest Communications Is First Major Telecom Company to Provide Voice over Internet Protocol Services to Customers* (Dec. 10, 2003). *Comcast to Offer VoIP to 40 Million by 2006* (May 27, 2004); http://www.smh.com.au/articles/2004/05/27/1085461868612.html?from=storyrhs&oneclick=true.

149 *If You Can't Beat 'em, Join 'em,* ECONOMIST (Dec. 20, 2003).

consumers use wireless phones at all—where they *expect* signal quality to be less than what they would find on a nearby fixed line—strongly suggests that consumers are willing to consider the tradeoffs (e.g., the convenience of mobility for lower-quality connections). Consumers will exercise similar preferences in the VoIP market, with a range of alternative qualities supplied, provided that regulators allow choice. By imposing inflexible standards, regulation could kill off some of the least expensive, most competitive VoIP services now emerging.

FCC Chairman Michael Powell suggests that the burden of proof for regulating VoIP "should be on those who want regulations extended."[150] Newly proposed legislation in Congress would prevent states from regulating VoIP and would limit the types of regulations the federal government could impose on VoIP.[151] Meanwhile, the FCC is embroiled in a debate on how to regulate VoIP, and state regulators, concerned about revenues raised through telecommunications taxes, are pushing for the right to tax VoIP. We return to these issues in our policy analysis in Section V.

UNLEASHING COMPETITIVE TECHNOLOGY

The opportunities for competitive network development are ripe. To unleash this competition and stimulate investments, policymakers must not only end policies that favor one network over another but also end price distortions driven by misguided approaches to providing universal service. Before outlining affirmative competitive policies in Section V, we review the historic evolution of funding universal service—a social good that, as currently provided, heavily taxes the competitive telecommunications sector.

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150 Mark Wigfield, *FCC Holds Hearing on Internet Telephony*, DOW JONES NEWSWIRE (Dec. 1, 2003).

151 On April 5, 2004, Senator John Sununu (R-NH) introduced S. 228, "VoIP Regulatory Freedom Act of 2004," and Representative Chip Pickering (R-MS) introduced H.R. 4129, "VoIP Regulatory Freedom Act of 2004"; http://www.techlawjournal.com /topstories/2004/20040405.asp.

Table IV-B. VoIP Option Plans Company	Plan	Monthly Fee	Features of Plan
Vonage	Basic 500	$14.99	500 minutes of local and long-distance calling within the United States and Canada.
	Unlimited Local	$24.99	Unlimited local and regional calling, plus 500 long-distance minutes within the United States and Canada.
	Premium Unlimited	$29.99	Unlimited local and long-distance calling within the United States and Canada.
	Small Business Basic	$39.99	1500 local and long-distance minutes for calling anywhere within the United States and Canada.
	Small Business Unlimited	$49.99	Unlimited local and long-distance calling within the United States and Canada.
Skype	All Destinations	€0.017 per minute to 22 countries worldwide.	Skype-to-Skype calls are free of charge. Rates for other calls vary from country to country.
AT&T	CallVantage Service	$34.95	Unlimited local and long-distance calling.
Packet8	Freedom Unlimited	$19.95	Unlimited calls in the United States and Canada. Unlimited worldwide calls to other Packet8 members.
	Business 2000	$34.95	2000 business calling minutes in the United States and Canada. Unlimited calls to other Packet8 members.
Lingo	Basic Plan	$14.95	500 U.S., Canada, and Western Europe anytime minutes. Unlimited calls to other Lingo subscribers.
	Unlimited Plan	$19.95	Unlimited U.S., Canada, and Western Europe anytime minutes. Unlimited calls to other Lingo subscribers.
	Unlimited International Plan	$79.95	Unlimited long-distance calling within the United States, to Canada, and to many other international countries. Unlimited calls to other Lingo subscribers.
	Business Unlimited Plan	$49.95	Unlimited U.S., Canada, and Western Europe anytime minutes. Free fax line with a low per-minute rate based on where one is faxing.
	Business Unlimited International Plan	$99.95	Unlimited long-distance calling within the United States, to Canada, and to many other international countries. Free fax line.
Cablevison	Optimum Voice Service	$34.99	Unlimited calling throughout the United States and Canada.
Cox Communications	Cox U.S. Savings Plan	$3.95	$0.07 per minute for interstate long-distance and intrastate long-distance calling.
	Simply Five Savings Plan	$4.95	$0.05 per minute for interstate long-distance and intrastate long-distance calling.
	Cox U.S. 250 Savings Plan	$15.00	250 minutes of intrastate and interstate usage. Charge of $0.07 per additional minute.
	Cox U.S. 500 Savings Plan	$25.00	500 minutes of intrastate and interstate usage. Charge of $0.05 per additional minute.

Sources: http://www.vonage.com/products.php; http://www.skype.com/skypeout/help.globarate.html; http://www.usa.att.com/callvantage/savings_calc/index.jsp; http://www.cox.com/Telephone/directdial.asp; http://www.optimumvoice.com/index.jhtml?pageType=pricing; http://www.packet8.net; https://www.lingo.com/guWeb/; http://www.dcs.net2phone.com/account/voiceline/english/callingplan.asp; http://www.galaxyvoice.com;

Universal Service

The term "universal service"—that "some sort of connection with the telephone system should be within reach of all"[152]—was coined by Theodore N. Vail, creator of the Bell System and chairman of AT&T, in the early 1900s to describe the benefits of one national telephone company. Regulators later embraced the goal, seeking to extend network reach. This required extending telephone lines to areas that could not be profitably served. Regulators developed a system of financing that relied on cross-subsidization, a pricing structure that charges some customers rates above costs so that others can pay rates below cost. Long-distance, urban, and business telephone services are generally billed above cost; local, residential, and rural services are often subsidized. Because individual usage patterns cross categories—a rural business uses long-distance service, for example—the actual incidence of the taxes levied (in the form of high prices) and the subsidies received are complicated to trace. Cross-subsidization is all the more complex because of secondary effects—for instance, the impact on consumers of higher telephone charges for businesses.

When AT&T was a monopoly, subsidies were provided as intracompany transfers. Today, universal service policy is implemented through a mix of transfers. Some continue to be intrafirm, as a given telephone company serves some customers at a loss, offset by high margins elsewhere. Some transfers are made between firms, however, as taxes are collected and paid out to qualifying networks. But the basic flow of subsidies remains largely unchanged.

Supporters of universal service policies point to both economic and social benefits from the policy. Phone systems exhibit network effects, meaning that the value of the service is related to the number of users connected to it. The social benefit of connecting an additional user to the telephone network is therefore greater than the private benefit that a new user personally experiences. The goal of universal service policy is to ensure that as many Americans as possible have telephone service. The ability to use the phone as a tool for work, education, and information has made it an essential part of everyday life that has assisted both economic development and social welfare. For example, the ability of all households to call "911" is viewed as crucial to public safety. Policymakers reaffirmed support for universal service in the Telecommunications Act of 1996.[153]

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[152] Theodore N. Vail, in AT&T ANNUAL REPORT (1910), at 22.

[153] "The goals of universal service, as mandated by the 1996 Act, are to promote the availability of quality services at just, reasonable, and affordable rates; increase access to advanced telecommunications services throughout the Nation; advance the availability of such services to all consumers, including those in low income, rural, insular, and high cost areas at rates that are reasonably comparable to those charged in urban areas. In addition, the 1996 Act states that all providers of telecommunications services should contribute to Federal universal service in some equitable and nondiscriminatory manner; there should be specific, predictable, and sufficient Federal and State mechanisms to preserve and advance universal service; all schools, classrooms, health care providers, and libraries should, generally, have access to advanced telecommunications services; and finally, that the Federal-State Joint Board and the Commission should determine those other principles that, consistent with the 1996 Act, are necessary to protect the public interest." http://www.fcc.gov/wcb/universal_service/.

Currently, federal universal service support is divided into four categories: high-cost support; low-income; schools and libraries; and rural health care. High-cost support goes to carriers in areas of the country—generally rural carriers—where the cost of phone service is considerably more than the national average. Low-income support goes to customers who qualify for reduced-rate services. The remaining two categories subsidize access and equipment. For the year 2002, the federal government spent about $5.3 billion through the FCC, with roughly 56 percent of that amount for high-cost support, 31 percent for schools and libraries, 13 percent for low-income, and 0.4 percent for rural health care.[154] This federal universal service support rose from $3.5 billion in 1998.

Financial support for the federal Universal Service Fund comes mainly from subscriber line charges. This is an amount added to each fixed-line phone bill. In 2002, the subscriber line charge of $5.64 added approximately 32 percent to the residential phone bill for local services. In July 2003, the charge was capped at $6.50 per month.[155]

In addition to these federal programs, state universal service programs exist. Typically, state regulators increase business, toll, premium services,[156] and carrier access rates[157] above costs to price basic residential service below costs. Intrastate rates generally are uniform across a company's service territory, even though network access costs are greater in sparsely populated areas than in larger cities. State universal service funds often provide subsidies for companies that serve higher-cost areas. These funds may include subsidies for low-income users and emergency services.

Universal service policies largely fail cost-benefit tests. They distort price signals and make phone service less useful. They tend to increase charges where demand is most responsive to price, such as in long-distance service and decrease prices for basic service—the least price-responsive telecom service. Economists Robert W. Crandall and Leonard Waverman calculate that doubling the basic service charge would reduce subscriptions by just 0.3 percent.[158] Jerry Hausman's econometric analysis of a federal universal service program to subsidize Internet service for schools and libraries found that every dollar spent on the program cost the economy $1.05 to $1.25.[159]

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154 Federal Communications Commission, Wireline Competition Bureau, Industry Analysis and Technology Division, *Trends in Telephone Service* (May 2004), at Table 19.1; www.fcc.gov/wcb/stats. Schools and libraries, and rural health care programs operate on a school year rather than on a calendar year. Amounts for those programs in 2002 are for July 1, 2001, to June 30, 2002.

155 The average monthly charge for local residential service was $23.38 in 2002. *Id.* at Table 13.1. Federal Communications Commission, *FCC Consumer Facts*; http://www.fcc.gov/cgb/consumerfacts/accesschrg.html.

156 For example, fixed-line services.

157 Carrier access rates are the regulated charges paid to local phone companies to terminate calls from other networks, such as long-distance.

158 ROBERT W. CRANDALL AND LEONARD WAVERMAN, WHO PAYS FOR UNIVERSAL SERVICE? WHEN TELEPHONE SUBSIDIES BECOME TRANSPARENT (Brookings Institution Press, 2000), at 106.

159 Jerry Hausman, *Taxation by Telecommunications Regulation*, NBER WORKING PAPER 6260 (Nov. 1997).

SUMMARY

An impressive number of competitive networks and applications are now emerging to challenge incumbent local exchange carriers. See Table IV-C. Given this rich, rivalrous assortment, policymakers should focus on measures that unleash these promising new alternatives and develop new approaches to funding universal service. Policies are needed to invigorate these opportunities, a question we turn to in Section V.

Table IV-C. Alternative Delivery Platforms in Telecom

Network	Voice	Broadband	Video
Traditional Telephone Plant	182,812,712	9,509,442	*
Cable Network	2,710,000	16,446,322	70,490,000
BSPs	543,000	452,000	1,400,000
Mobile Wireless	158,721,981	*	-
Fixed Wireless	*	139,118	200,000
Satellite	*	228,000	22,862,191
BPL	*	*	-
Fiber to the Premises (FTTP)	*	*	-

Notes & Sources: * = negligible or service in early stages of development. Total traditional telephone lines are as of June 2003, from Federal Communications Commission, Wireline Competition Bureau, Industry Analysis and Technology Division, *Trends in Telephone Service* (May 2004), at Table 8.1. Data for Cable network voice subscribers are from Kagan Research, *Future of Cable Telephony* (2003), at 5. We estimated BSP voice and broadband subscriber data from Comments of Broadband Service Providers Association, MB Docket No. 03-172 (Sept. 11, 2003), at 6. Video subscriber data are from Federal Communications Commission, *Tenth Annual Report in the Matter of Annual Assessment of the Status of Competition in the Market for the Delivery of Video Programming*, MB Docket No. 03-172 (2004), at Appendix B, Table B-1. Satellite broadband subscriber data are from backup tables to Legg Mason, *2003: A Banner Year for Broadband as DSL Gains Momentum* (Mar. 5, 2004). Traditional telephone plant, cable network broadband, and satellite or wireless line data are from Federal Communications Commission, Wireline Competition Bureau, Industry Analysis and Technology Division, *High-Speed Services for Internet Access: Status as of December 31, 2003* (June 2004), at Table 1. We estimated fixed wireless lines by subtracting satellite lines from satellite or wireless lines. Mobile wireless subscribers as of December 2003; http://files.ctia.org/img/survey/2003_endyear/752x571/SEMI-A2.jpg.

V
AFFIRMATIVE COMPETITION POLICY

Policymakers need an exit strategy to escape the regulatory morass over network-sharing rules, and such a strategy exists: affirmative competition policy. Unleashing emerging communications platforms will intensify competitive market pressures. Regulators, while investing great time and effort in a failed, eight-year effort to craft complex unbundling rules, have paid scant attention to reforms that would empower these promising emerging platforms. While reducing investment disincentives by scaling back network-sharing obligations for incumbents, policymakers should craft rules that allow widely varying VoIP services to compete freely in the local exchange market. State regulation of VoIP should be preempted, and taxes and access charges should be reduced or abolished. Policymakers should allocate large bandwidth to flexible-use licenses and then auction it to wireless service providers. Satellite slots should be released, with additional spectrum access rights. Policymakers should quickly design BPL spectrum interference rules and eliminate anticompetitive entry barriers facing broadband service providers. Funds to support universal service should come from general tax revenues rather than from hidden charges that hurt competition.

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DEREGULATORY REFORMS

The network-sharing regulatory program is not working. As wholesale prices for existing network services have become more attractive, the predicted increase in resold lines has materialized. But this resale market appears to displace emerging competitive platforms. Regulators thought that network sharing would be a "stepping stone" for investment in competitive network platforms. Yet the unintended consequence of network sharing is that companies that share networks have become more dependent on regulators to ensure profits. Network sharing has helped push companies such as AT&T, which in 1998 and 1999 was aggressively buying cable assets to use their wires to provide last-mile competition to local exchange carriers, to abandon such efforts in favor of UNE-P.[160]

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160 In September 1999, AT&T told the Federal Communications Commission that its acquisition of MediaOne, then the third largest cable operator, would enable it to provide local telephone competition in the only mode that was realistically feasible: facilities-based entry. Resale was characterized as prone to failure because of regulatory complexity and obvious incentives for noncooperation. The acquisition followed the AT&T/TCI merger the year before and gave the new firm cable service to about 35 percent of U.S. homes. AT&T then divested these cable assets in a sale to Comcast in 2002. A. Michael Noll, *The Comast/AT&T Deal: Light at the End of the Tunnel for AT&T?* (Jan. 11, 2002); http://www.citi.columbia.edu/amnoll/Comast-AT&T-z.htm.

In 1996, FCC chief economist Joseph Farrell noted that the commission was intending not to "*allow* competition, but to *create* competition."[161] But, today, policymakers must focus on *allowing* competition by clearing away barriers preventing the rise of rival telecom networks. And those barriers include key elements of the regime devised to *create competition*, including TELRIC-priced UNE-P.

Emerging technologies are now establishing themselves as viable competitors to legacy networks without assistance from network-sharing rules. Indeed, unbundling and resale are at best irrelevant to the formation of new voice networks offered by cable telephone operators or mobile phone networks. "If you are an incumbent," FCC Chairman Michael Powell recently noted, "[y]ou ought to be terrified because we are lowering the barriers to offering a service to which you have dedicated a massive infrastructure."[162] The regulatory effort to establish far-reaching network-sharing mandates has been made unworkable by its ambitiousness and obsolete by the market. Economist Gerald R. Faulhaber concludes:

> Can we expect more competition in telephony? Yes, but it is unlikely to come from entrants seeking to replicate existing service offerings, either through local loop unbundling or building out their own voice facilities. Competition is much more likely to come through new technology that offers features and functions not currently available through wireline systems, at a price designed to move product. Can policymakers do anything to help? Yes; reduce uncertainty for new entrants by clarifying regulatory rules regarding these new technologies, and clear out the regulatory underbrush that could stifle competition, such as limited wireless bandwidth and restrictive local practices for cable competition approvals.[163]

Regulators should both strip away barriers to new network formation and simultaneously end overregulation of incumbent telecommunications networks. This dual strategy will create a marketplace for American consumers in which multiple platforms offer innovative choices and superior prices for data and video as well as voice service. "In some ways the battlefield has already moved way beyond skirmishes over [wholesale] pricing," said Billy Jack Gregg, a consumer advocate in West Virginia. "It really is now the question of … who has broadband access to the network."[164]

Competing wireless and cable networks are already in place to challenge legacy phone networks, while rapidly expanding broadband connections—with VoIP coming of age—result in additional competitive pathways. Put simply: *broadband access + an*

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[161] Joseph Farrell, *Creating Local Competition*, 49 FED. COMM. L.J. 201 (1996); http://www.law.indiana.edu/fclj/pubs/v49/no1/farrell.html.

[162] FCC Chairman Michael Powell, quoted in Peter Thal Larsen and Paul Taylor, *FCC Chief in VoIP Warning*, FIN. TIMES (May 5, 2004), at 28.

[163] Gerald R. Faulhaber, *Policy-Induced Competition: The Telecommunications Experiments*, 15 INFO. ECON. & POL'Y. 73 (2003), at 96–97.

[164] *Telecom Deregulation May Raise Bills—But How Much*? DALLAS MORNING NEWS (June 10, 2004), at 10.

Internet application = last-mile voice competition. This fundamentally alters market dynamics. As an article in the *e-Commerce Times* recently noted:

> This market has changed profoundly since the Telecom Act was established eight years ago. The regular phone had few alternatives. Cell phones were still in their infancy. The scratchy, analog cell service that most people used was too expensive and unreliable to serve as a primary connection. Voice over the Internet protocol (VoIP) was even worse, a high-tech ham radio for geeks. It sounded just dreadful.
>
> All that has changed now. Wireless and VoIP have come into their own and are more than just alternatives to the regular phone. Traditional phone companies like Verizon (VZ), SBC, BellSouth (BLS) and AT&T are redefining themselves around these new technologies, lest they get left behind.[165]

POLICIES FOR EMERGING COMPETITIVE PLATFORMS

To promote the creation of competitive voice, video, and data networks, to encourage new investment, and to speed the deployment of innovative technologies, policymakers must implement major reforms for each of the emerging telecommunications platforms.

Wireless Networks

The robust competition among six national wireless networks has reduced prices to an average of just over 10¢ per minute. Yet U.S. wireless carriers face substantial constraints imposed by the artificial scarcity of spectrum, a result of FCC spectrum allocation decisions allowing carriers to use only about 170 MHz of bandwidth.[166] This is far below the total cellular allocations in such countries as Germany, the Netherlands, and the United Kingdom, whose wireless carriers are licensed to use more than 300 MHz. Since the FCC allowed 120 MHz of spectrum for licensed PCS service in 1994,[167] essentially no new bandwidth has been made available for the industry to utilize. This inactivity has come during a decade in which considerable new allotments were made for third-generation services in advanced economies throughout the world.

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165 Steve Rosenbush, *Finally, A Free Market for Telecom*, BUS. WEEK ONLINE (June 10, 2004).

166 While 189 MHz are formally available for use nationwide, much less bandwidth is utilized, given the ongoing distribution of PCS C-block licenses first auctioned in 1996 but caught up in bankruptcy proceedings. Handicapping competitive bidding to favor small businesses and rural telephone companies resulted in this policy debacle. See Thomas W. Hazlett and Babette Boliek, *Use of Designated Entity Preferences in Assigning Wireless Licenses*, 51 FED. COMM. L. J. 639 (May 1999).

167 Federal Communications Commission, *In the Matter of Amendment of the Commission's Rules to Establish New Personal Communications Services*, 94-144 F.C.C. ¶ 10 (1994).

While additional bandwidth will return large social dividends and while operators are prepared to spend billions of dollars for new licenses,[168] U.S. public policy has been lethargic. In November 1999, an FCC Spectrum Report committed the commission to licensing an additional 183 MHz of spectrum with flexible-use rights and listed the bands to be licensed. To date, the spectrum has not been reallocated to new, productive uses.[169] Part of the reason is *intentional* delay. In March 2001, the Bush Administration announced that a 700 MHz license auction would occur soon but then delayed the auction until September 2004 on the expectation that the delay would result in higher bids. Such an approach is penny wise and pound foolish.

Additional bandwidth would create lower prices for wireless services and billions of dollars in consumer savings. It would result in greater productive efficiency for U.S. businesses and intense competition for "last mile" services. These extend beyond voice, to high-speed data and, eventually, video. Airwaves that are now little used could be placed into far more productive use by cellular networks, which could make cell phone use near ubiquitous. The growth of usage would spark additional applications and make cell phones a more compelling substitute for fixed-line service.

This trend is already observed in global markets. In many developing countries, wireless has displaced wireline as the platform of choice. And in developed countries incumbent telecommunications providers face increasingly fierce competition, in some cases losing *more than one-half* of wireline traffic to wireless entrants.

Value of access to new spectrum. A recent econometric analysis of wireless markets in twenty-nine countries showed that the relationship between spectrum allocation and retail prices was strongly negative. Countries with more allocated spectrum enjoyed substantially lower prices for mobile phone service, and the difference is statistically significant.[170] Using this model, one can estimate how much U.S. cellular rates would decline were more bandwidth available to operators. Simulations show that the average price per minute of use, estimated in the model to be about 11¢ in 2003, would fall to about 8.5¢ if an additional 80 MHz were allocated and to under 6¢ per minute were 200 MHz made available. Demand is found to be elastic, meaning that the minutes of use of mobile telephone service would rise by a larger percentage increase than the percentage decrease in prices. See Table V-A.

These changes would produce huge social benefits on their own: some $32 billion in additional consumer surplus (the increase in consumer well-being over and above what

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168 This was demonstrated in January 2001, when an auction for licenses that allocated 30 MHz of radio spectrum in the PCS C-block and 10 MHz in the F-block bands drew aggregate bids of about $16 billion. The auction became moot when a federal court ruled that the licenses auctioned by the FCC actually belonged to NextWave, a firm reorganized through bankruptcy. Caron Carlson, *NextWave, FCC Settle Wireless Spectrum Battle; Bringing the Eight-Year Feud to a Resolution, NextWave Will Keep 300 MHz of Spectrum While Returning Most of Its Licenses to the FCC for Reauctioning to Other Wireless Carriers*, EWEEK (Apr. 21, 2004).

169 Thomas W. Hazlett, *Selling the Ether*, MILKEN INST. REV. (Fourth Quarter 2003).

170 Thomas W. Hazlett and Roberto Muñoz, *A Welfare Analysis of Spectrum Allocation Policies*, Manhattan Institute for Policy Research (June 10, 2004).

the service costs them) is generated per year with another 80 MHz allocated to wireless telephony. In addition, local telephone competition becomes more robust as cellular prices fall.

Table V-A. Annual Consumer Gains from Increased Availability of Mobile Phone Spectrum

		80 MHz		140 MHz		200 MHz	
Variable	**Initial Value**	**Final Value**	**% Change**	**Final Value**	**% Change**	**Final Value**	**% Change**
Average Price/Minute	0.112¢	0.084¢	–25.00	0.069¢	–38.39	0.056¢	–50.00
Min. of Use/Month (millions)	78,340	115,098	46.92	135,763	73.30	153,038	95.35
Change in Consumer Surplus ($ millions)		31,850		55,072		77,419	

Notes & Sources: Results are estimates from the model calibrated in Thomas W. Hazlett and Roberto Muñoz, *A Welfare Analysis of Spectrum Allocation Policies*, Manhattan Institute for Policy Research (June 10, 2004). See also Thomas W. Hazlett, *Exit Strategies for the Digital Television Transition*, testimony before the U.S. Senate Commerce Committee (June 9, 2004).

The value of licenses sold at auction reflects only a small part of the gains associated with additional spectrum allocations. That is so because firms bidding for licenses price their bids on the basis of expected profits, which are likely to be at least an order of magnitude *less* than the consumer surplus generated by additional spectrum. Moreover, the more bandwidth mobile competitors can use, the less a given license will be worth at auction, precisely because competitive pressures intensify as additional capacity is available to service providers.

Nonetheless, firms are still willing to pay substantial sums for the licenses being offered today in secondary markets. Bids for licenses are estimated at about $1.65 per MHz per person (in the area covered by the license). Hence, a license with flexible-use rights to 10 MHz of nationwide spectrum has an estimated value of about $5 billion.[171]

Availability of additional spectrum. While broad liberalization of spectrum use would accomplish the goals sought in solving the "last mile" competition problem, we focus on the immediate task at hand.[172] If the existing "command and control" apparatus could succeed in making additional spectrum available for use on a licensed, flexible-use basis, the market could then decide how best to use this bandwidth. This largely follows the policy now in place for commercial mobile radio services (CMRS), which include cellular, PCS, and SMR licensees, who are given wide latitude over what services to provide, what technologies to deploy, and what business model to select (such as advertising-supported vs. fee-based services).

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171 This is also the amount that Verizon Wireless recently offered to pay the FCC for a 10 MHz license allocated 1.9 GHz spectrum. Donny Jackson, *Verizon Wireless Bid Pledge Complicates 800MHz Plan*, TELEPHONY.ONLINE (Apr. 19, 2004).

172 In February 2001, a group of thirty-seven prominent policy economists petitioned the FCC to restrict its regulation of radio spectrum to policing interference and assisting antitrust authorities in promoting competitive markets. Federal Communications Commission, *In the Matter of Promoting Efficient Use of Spectrum through Elimination of Barriers to the Development of Secondary Markets,* No. 00-230 (2001). On the specifics of liberalizing radio spectrum use, see Thomas W. Hazlett, *Liberalizing Radio Spectrum Allocation*, 27 TELECOMM. POL'Y 485 (2003).

Spectrum is available in a number of bands where the opportunity costs of reallocation are low to nonexistent. The most efficient way to convert a band from one use to another is via the device known as an "overlay right." An overlay right (used successfully with PCS) gives the new licensee the right to use defined bandwidth, subject to noninterference with existing users. The licensee can either engineer new systems around the obstruction or negotiate to move the grandfathered rights holder to alternative bands or communications links (such as to fiber-optic cables).

Fortunately, the FCC has periodically conducted surveys to identify from where bandwidth could most usefully be reallocated. We have discussed the FCC's 1999 survey that identified 183 MHz. In 2002, an excellent research paper by FCC senior policy experts Evan Kwerel and John Williams identified 438 MHz as available for immediate reallocation to flexible-use licenses.[173] These frequencies are all located below 3 GHz, making them ideally suited for mobile phone use, wireless local loops, and high-speed Internet access. We outline the various reallocations already "on the table" in Table V-B.

Table V-B. Bands Available for Reallocation to Wireless Telephony

Band	Current Allocation	Bandwidth (Part of 438 MHz)	Status
VHF/UHF	Broadcast TV	402 MHz (78 MHz)	Mostly unused; tied up in digital TV transition.
2.5 GHz (MMDS/ITFS)	Microwave pay TV; instructional TV	190MHz (190 MHz)	Conflicting rules have reduced the value of licenses by over 90 percent (compared with PCS licenses using nearby band); a consortium of licensees have recommended new rules to allow third-generation use, but political concerns have blocked a decision since 2002.
1.7 GHz	DoD	90 MHz (45 MHz)	Transferred from government; scheduled to be auctioned.
2 GHz MSS	Mobile satellite service	70 MHz (70 MHz)	Currently unused.
2 GHz General and Fixed Mobile Band	Various	55 MHz (55 MHz)	Transferred from government; scheduled to be auctioned.

Source: Evan Kwerel and John Williams, *A Proposal for a Rapid Transition to Market Allocation of Spectrum*, FEDERAL COMMUNICATIONS COMMISSION OFFICE OF PLANS AND POLICIES WORKING PAPER NO. 38 (Nov. 2002).

Spectrum policy not only can fuel the growth of mobile phone voice networks; it also can provide the "third way" for broadband to be supplied to homes or small businesses. Fixed wireless broadband operators are operating in various countries and, in a limited way, in the United States. Fixed wireless offers high-speed network access that rivals the service provided by cable modem and DSL service providers. A brief summary is provided in Table V-C. Spectrum access for fixed wireless is, of course, crucial. So

173 Evan Kwerel and John Williams, *A Proposal for a Rapid Transition to Market Allocation of Spectrum,* FEDERAL COMMUNICATIONS COMMISSION OFFICE OF PLANS AND POLICIES WORKING PAPER No. 38 (Nov. 2002).

long as regulators leave wireless operators starved for bandwidth, fewer services will be provided, and quality will suffer.[174]

Flexible use rights to the 438 MHz of spectrum imminently suitable for quick reallocation could be issued at auction; indeed, incumbents with vested rights in the relevant bands could also enter the license auction to sell these dispersed rights to new entrants. FCC analysts describe this two part auction as a "big bang." On the basis of the estimated consumer benefits generated by newly available spectrum, the auction would provide sharp stimulus to the U.S. economy. More important, this competitive market segment could introduce multiple networks per market, in much the same way that mobile telephony now has six robust competitors. Hence, fears that market power concerns would limit broadband to a duopoly[175] would dissipate.

Table V-C. Competing High-Speed Wireless Internet Access Technology

Operator	Technology Provider	Technology	Maximum / Average Speed	Deployments
Nextel	Flarion	FLASH-OFDM	3 Mbps	North Carolina
Vodafone	ArrayComm	iBurst	1 Mbps	Australia
Various	IP Wireless	TDD CDMA	6 Mbps	United States, Australia, Germany, Malaysia, New Zealand, Portugal, South Africa, United Kingdom
Verizon Wireless	Qualcomm	EV-DO	300-500 Kbps	United States, Korea
Clearwire	NextNet	Proprietary	1.5 Mbps	N/A

Sources: Federal Communications Commission, Wireline Competition Bureau, Industry Analysis and Technology Division, *Trends in Telephone Service* (May 2004). Michael Doherty, *The US Moves Towards Wireless Broadband*, OVUM (Jul. 2004), at 11-12. Dan Richman, *McCaw Leaps Back into Wireless*, THE SEATTLE POST INTELLIGENCER (Jun. 3, 2004). Eric Lin, *Verizon Will Expand EV-DO Nationwide* (Jan. 9, 2004); http://www.thefeature.com/article?articleid=100308; http://www.iburst.com/au/site/iburst/iburst_features.php; http://www.ipwireless.com/company/; http://www.dailywireless.org/modules.php?name=News&file=print&sid=2628; http://www.flarion.com/products/flash_ofdm.asp; http://www.msnbc.msn.com/id/5124765/.

Cable Phone Competition[176]

Cable telephony is the dog that did not bark. Why have cable operators, who have networks in place available to over 95 percent of U.S. households, been reluctant to invest the incremental sums necessary to offer telephone service to these homes? The experience of Cox Communications, the one large operator that has aggressively entered the telephone market early, shows that buildouts are possible; Cox reports that telephone buildouts are financially viable, as well.[177] Many analysts believe that regulatory

[174] Scott Wooley, *Jammed!* FORBES (Jan. 7, 2002); http://www.forbes.com/forbes/2002/0107/130_print.html.

[175] Congressional Budget Office, *Does the Residential Broadband Market Need Fixing?* (Dec. 2003).

[176] Robert W. Hahn helped write this part of the report, which draws from earlier work by Robert W. Crandall, Robert W. Hahn, Robert E. Litan, and Scott Wallsten, *Why the Government Should Not Regulate Internet Telephony*, AEI-BROOKINGS JOINT CENTER FOR REGULATORY STUDIES REGULATORY ANALYSIS 03-12 (Dec. 2003).

[177] George Winslow, *"It's the Bundle Baby": Cox's Rooney Is One Marketing Pro Who's Got It All Together,* BROADCASTING & CABLE (May 3, 2004).

uncertainty over VoIP rules has induced many systems to delay entry into new markets and that the threat of UNE-P resale has undermined investment incentives.[178] Policymakers should address both concerns.

Riding on the network. Most of the cost of traditional telephone service is in the local network's delivery of the call. Once a call is transmitted from a local connection to a long-distance carrier, it costs only a small fraction of a cent per minute to deliver it to a local telephone company somewhere else, even if the call travels halfway around the world. If consumers can avoid the costs of traversing a local company's networks, the cost of the call falls dramatically (in percentage terms).[179] VoIP achieves this by providing its service on a customer's existing broadband connection. The broadband connection incurs all the physical network costs—VoIP rides on the infrastructure.

A wireless or traditional fixed-line package of unlimited local and long-distance calling may cost $50 per month, [180] but VoIP can be delivered at a fraction of this cost, perhaps less than $20 per month.[181] Therefore, if the companies offering this service identify households with high-speed Internet connections and market this new service at a customer acquisition cost of, say, $200 or less, they can profitably offer the service at $30 or $35 per month, assuming a mean subscriber term of two years or more. How consumers will ultimately respond to VoIP is yet unknown, but it is safe to say that traditional telephone companies and their regulators are concerned.

Moreover, because VoIP comes in many forms, consumers would be able to choose from a number of different technologies as well as different levels of service quality. Some services require both ends of the phone call to connect through a PC; this is the cheapest form of VoIP and is apt to deliver the lowest-quality connection. On the other side, cable companies are investing substantial sums in VoIP networks that dedicate cable system bandwidth for the exclusive use of the system (avoiding local traffic congestion), use their own high-performance switches (to route traffic without Internet backbone delays), and are equipped with back-up power sources (meaning that phones will work even when household electricity goes off). Compared with VoIP between PCs,

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[178] It may also be true that operators have waited for VoIP technologies to mature, so waiting to invest has option value. Cox Communications argued against this analysis in its white paper, *Cox Communications' Strategic Approach to Maximizing the Business of Cable Telephony* (Feb. 2003).

[179] The price of connecting calls to local networks is regulated, but it has fallen dramatically in recent years except for intrastate long-distance calls, whose prices are kept artificially high by state regulators. The connection charges (originating and terminating) for an interstate call are now about 0.44¢ per minute for the large Bell companies. Although these charges may seem low, they can contribute substantially to the cost of telephone services that deliver between 500 and 1,250 minutes per month on average. See Federal Communications Commission, Wireline Competition Bureau, Industry Analysis and Technology Division, *Trends in Telephone Service* (May 2004), at Table 1.4; http://www.fcc.gov/wcb/stats.

[180] Each of the Web sites for SBC, AT&T, MCI, and Verizon offers a package of unlimited local and long-distance calling for $50 per month or less.

[181] See Table IV-B. The principal costs are local termination (to subscribers without broadband connections), local collocation costs (placing switches and routers in network-routing points), local telephone numbers, and long-distance transmission services.

this service is relatively expensive to provide but offers a much closer substitute to the fixed-line phone service most customers have grown accustomed to using.

Having a larger menu of diverse service choices would be good for consumers, who have different levels of demand and value price-performance tradeoffs differently. Consumers could grab bargains in situations where quality of service was less important or pay extra where reliability and signal clarity are absolutely critical.

State regulation. State regulators have expressed an interest in licensing and regulating VoIP providers much as they license telephone companies. Minnesota has already tried to launch such an effort.[182] But Internet services are provided regionally, nationally, or globally. Disparate state regulatory requirements, taxes, and fees on those services could prove highly disruptive.

Uniform national policies are particularly important when networks are created that cross state borders, because the costs incurred are felt far beyond the boundaries of the state that imposes regulations and, in turn, are not of great interest to state regulators. This creates a classic externality problem, where costs and benefits are not properly accounted for, and leads to economic irrationality.[183] Hence, Stephen Greenberg, CEO of Net2Phone, a prominent VoIP provider, states: "The worst case scenario would be for 50 state PUCs [public utility commissions] to take different positions, with one set of standards in Maine and another in Florida. If the [FCC] preempts that and promulgates rules for the entire industry, you get uniformity."[184]

State and local regulation of VoIP should be preempted. FCC Chairman Michael Powell has declared, "I don't know whether it's Internet or telephone, but I know it's not local."[185] He adds that the FCC, not the states or localities, is the principal regulatory authority for VoIP services and should be the "first in line to set the initial regulatory environment" for VoIP services. Neither the states nor localities have the appropriate incentives, and there is a real danger that states and localities could implement regulations that would hurt consumers.[186]

Federal regulation. At the federal level, a critical issue for the FCC is whether providers of different kinds of VoIP should be required to pay access charges—payments made to local exchange carriers delivering calls to the end-user. For years, access

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182 *Court Halts Minnesota's VoIP Regulation Plans*, 13 BROADBAND BUS. REP. 21 (Oct. 21, 2003). Thomas Hazlett, *Good Politics, Bad Policy,* FIN. TIMES (Nov. 5, 2003).

183 In a related market, see the analysis in Thomas W. Hazlett, *Is Federal Preemption Efficient in Cellular Phone Regulation?* 56 FED. COMM. L. J. 155 (2003).

184 Eric J. Savitz, *Talk Gets Cheap*, BARRON'S ONLINE (May 24, 2004). See also Kevin Werbach, *A Long, Hot Summer for VoIP?* CNET NEWS.COM (June 16, 2004); http://news.com.com/A+long%2C+hot+summer+for+VoIP%3F/2010-7352_3-5235523.html.

185 *FCC Chmn. Powell Said It Was Necessary To "Rethink" the Social Goal of Universal Service When Applying It to Voice over Internet Protocol (VoIP) Services*, COMM. DAILY (Dec. 9, 2003).

186 Robert W. Hahn, Anne Layne-Farrar, and Peter Passell, *Federalism and Regulation: An Overview*, REGULATION (July 2003). This prohibition of state and local regulation should fall under the competition policy enacted in the Telecommunications Act of 1996, which outlawed legal barriers to entry imposed by the states.

charges have been set substantially above costs to generate an implicit subsidy fund that compensates local exchanges for universal service obligations (including the obligation to charge uniform prices, even in high-cost parts of their service territory).

Consider two recent cases before the FCC. In the case of Pulver, a VoIP start-up, the FCC ruled that the firm's technology was an information service and therefore exempt from access charges.[187] In the case of AT&T, the FCC ruled that its VoIP technology was a telecommunications service and therefore subject to access charges. The disparate outcomes related to the fact that the Pulver VoIP service is "just" an application that looks like a computer program: two users with Pulver's software can talk to each other using PCs connected to broadband connections. Conversely, AT&T offered standard phone calls that used an IP link at some point in transit.

The three choices for an access-charge policy for VoIP are: (1) that access charges apply to some politically determined group of VoIP technologies; (2) that they are not applied to VoIP at all; or (3) that they are to be negotiated in the marketplace.

If some VoIP technologies had to pay access charges (the first choice), those applications would be less attractive to users. That helps incumbents, regulators, and exempt VoIP technologies but defeats the proconsumer goal of advancing competition. This choice would also trigger endless rulemakings to consider and reconsider access-charge exemptions.

Eliminating access charges (the second choice) would unleash competition but would create political turmoil by removing a major source of subsidy funding for universal service programs. But if subsidies were to be financed through a more efficient set of taxes (e.g., a tax on phone numbers, which would have a less-distorting effect on economic activity), then consumer welfare would be substantially improved.

Negotiated access charges (the third choice) would mean that a VoIP provider like Vonage, which now negotiates long-distance transport for its subscribers' phone calls as a substitute for negotiating local access,[188] would also negotiate local access with last-mile providers to deliver phone calls to people not using broadband connections. Because these local networks interconnect with multiple outside networks today, including those owned by competitors, such negotiated access solutions appear feasible.

In a sense, the dam has already been breached. The FCC has decided that PC-to-PC phone calls bypass the telephone system and should not incur access charges (as per the Pulver decision). But with the rapid march of technology, phone service will converge to PC plug-ins for an increasing proportion of phone calls, particularly given

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187 Federal Communications Commission, *In the Matter of Petition for Declaratory Ruling That pulver.com's Free World Dialup Is Neither Telecommunications Nor a Telecommunications Service, Memorandum Opinion and Order,* WC Docket No. 03-45 (2004).

188 All of Vonage's calls enter the public telephone network as if they were long-distance calls, even if they originated locally.

that heavy users of voice telephone service will have the most intense demand to escape access charges.

Note that major business enterprises are already converting corporate networks to all-IP, given the extensive use of high-speed networks and the advantages (including elimination of taxes such as access charges) of using data links for voice service. Over not too much time, substitution will make the regulation-imposed access fee irrelevant. Rather than distort economic choices and drag out the inevitable, it would be far preferable to replace access charges with an alternative funding source. This could be done in tandem with an economic appraisal of universal service subsidies, which is long overdue.

With regard to other possible regulatory mandates, we conclude that VoIP sellers should not be required to provide services beyond *possibly* "911" (which identifies a caller's location in connecting to local public-safety authorities, a more challenging task for Internet-based services that can be delivered at any network access point) or services required by the Communications Assistance for Law Enforcement Act,[189] access that lawmakers may view as high-value "public goods."[190] If, on the other hand, lawmakers determine that these services are not essential, providers will still respond to market forces by allowing the user to decide which ones are worth purchasing.[191]

This brief analysis of VoIP yields four conclusions. First, VoIP is emerging as a genuine competitor to traditional landline service; second, regulators may have a large impact on VoIP development; third, little economic rationale exists for regulating VoIP; and fourth, the worst outcome would be patchwork regulation, state by state.

Broadband Service Provider Entry

One of the most effective forms of competitive telephone service has occurred via competition among *cable* operators. The entry by head-to-head cable TV rivals, formerly called overbuilders and now referred to as broadband service providers,[192] has proven to be highly effective in lowering prices; video subscriptions are found to be about 15 percent less expensive in such markets.[193]

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189 The Communications Assistance for Law Enforcement Act (CALEA) requires covered telecommunications providers to help law enforcement agencies to tap phones and provide other information about customers. The FCC recently voted to impose CALEA requirements on VoIP providers. Declan McCullough and Ben Charny, *Feds Back Wiretap Rules for Internet*, CNET NEWS.COM (Aug. 4, 2004); http://news.com.com/Feds+back+wiretap+rules+for+Internet/2100-7352_3-5296417.html.

190 Other examples include services related to homeland security and services for the disabled.

191 Market demand would seem to work much better in achieving the optimal amount of "911" service, where the user tends to gain directly from access to emergency services, than with CALEA mandates, which provide benefits dispersed among the population generally.

192 Federal Communications Commission, *Tenth Annual Report in the Matter of Annual Assessment of the Status of Competition in the Market for the Delivery of Video Programming,* MB Docket No. 03-172 (2004), ¶¶ 78–84.

193 General Accounting Office, *Issues Related to Competition and Subscriber Rates in the Cable Television Industry*, GAO-04-8 (Oct. 2003).

But the competition extends beyond video services, because BSP entrants inevitably seek to offer a broad range of services. This includes not only the standard "triple play" of voice, video, and high-speed data, but additional features—for instance, supplying faster broadband access that accommodates video-streaming applications better than do existing systems.[194] See Table V-D. BSP competition not only brings a fixed-line phone rival into the market, but also often motivates the incumbent cable operator to offer voice service and effectively gives consumers multiple choices for local fixed-line service.

Table V-D. Two Major Broadband Service Providers

Operator	Main Markets	Homes Passed	Subscribers Video	Subscribers Broadband	Subscribers Telephone
RCN	Northeast United States, Chicago, California	1,400,000	370,187	174,898	253,132
Knology	Georgia, Alabama, Florida, South Carolina, Tennessee, Kentucky	935,640	183,783	73,482	118,872

Sources: Federal Communications Commission, *Tenth Annual Report in the Matter of Annual Assessment of the Status of Competition in the Market for Delivery of Video Programming,* MB Docket No. 03-172 (released Jan. 28, 2004), at 57; Kagan World Media, *Future of Cable Telephony* (Oct. 2003), at 122, 124; company SEC 10-K filings.

BSP entry requires substantial investment, and financial markets have severely constrained recent build outs. A more favorable regulatory climate could help expand this very successful market experiment. While BSPs pass only about 6 percent of U.S. households,[195] regulators should be driven by the highly proconsumer effect of this entry and allow the competitive frontier to grow.

BSPs have petitioned regulators on a range of issues:

- Rules limiting actions of incumbent cable operators. These include an expansion of program-access rules in place under the Cable Television Consumer Protection and Competition Act of 1992 (striking down certain types of exclusive agreements between cable program networks and cable operators), rules limiting price discrimination to respond to a new entrant (it is quite common for cable systems to lower prices dramatically just on the specific streets that a rival can service), and sanctions against malicious conduct (for instance, splicing cable lines to disrupt service); and,

- Limitations on burdens imposed by cable TV franchises issued by local governments. Franchises typically are issued only after long delays and "needs

194 Jeff Baumgartner, *One-Upsmanship: RCN Offers 7 Mbps Cable Modem Service*, CED MAG. (July 27, 2004); http://www.cedmagazine.com/cedailydirect/2004/0704/cedaily040727.htm. See also Thomas W. Hazlett and George Bittlingmayer, *The Political Economy of Cable "Open Access,"* STAN. TECH. L. REV. (2003), at Table 1.

195 See data and discussion in Section IV.

> assessments" and often include universal service requirements. These requirements are proposed by incumbents who argue that it is unfair for an entrant to build only in profitable areas. But an entrant, constrained by competition to charge lower prices and splitting market share with a rival, cannot fund the same promises. Governments may also require the applicant to pay subsidies (for example, for local programming studios) over and above the 5 percent-of-revenues franchise fee (capped by the Cable Communications Policy Act of 1984). These burdens bite deeply into a competitor's business plan.

The first set of concerns relates to actions that may deter entry. These issues involve detailed analysis by regulators because many of the actions taken to block competition in one situation can advance consumer interests in another. For instance, an incumbent operator may arrange an exclusive program deal to deny a new rival the ability to offer customers popular programs and will thereby reduce prospects for competition. On the other hand, a potential entrant may see an opportunity to bring local subscribers an important program channel that the incumbent has ignored and desires an exclusive agreement with the video network to help get its new system established (by, in part, offering unique programming). Antitrust policy addresses these issues, despite constituting a highly imperfect solution.[196]

An unambiguous policy solution presents itself for the second set of issues. Policymakers should impose federal rules limiting state and local franchise authorities, much as such agencies were preempted from enforcing franchise telephone monopolies in the Telecommunications Act of 1996. These rules should limit the regulatory burdens placed on new entrants. In short, the right to compete should be established. Franchise obligations that tend to limit competition[197] should be removed. In addition, standards for obtaining permits (including those involving the installation of power plants for cable telephone systems built by incumbents or entrants) and for utility pole attachments should be illegal if they serve to deter efficient entry. Municipalities should be able to impose public safety and bonding requirements (to mitigate public disruption), but cities and states should not impose additional obligations on entrants or institute regulations that (via cross-subsidies) require new competitors to fund public services.

Satellite Entry

Stimulating competitive rivalry in any of the "triple play" services has the potential to advance competition across the board. So suggests the history of satellite TV entry, which drove cable operators to add capacity to enter broadband markets and triggered telephone companies' defensive DSL investments. Ultimately, the broadband race sparked by satellite TV entry paved the way for mass-market VoIP, which now looms as a bona fide "last mile" alternative to traditional phone networks.

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196 See Thomas W. Hazlett, *Predation in Local Cable TV Markets*, ANTITRUST BULL. 609 (Fall 1995).

197 Such as universal service obligations, discussed above. In general, see Thomas W. Hazlett, *Duopolistic Competition in Cable Television: Implications for Public Policy*, 7 YALE J. ON REG. 65 (Winter 1990).

More satellite competition is feasible, and the capacity of satellite operators could well be enlarged. Again, critical regulatory barriers stand in the way. The FCC must make additional orbital slots and spectrum-use rights available to the market. Doing so would potentially intensify competition between cable and telephone companies and between rival phone carriers.

In 2002, a subsidiary of the largest European platform for satellite TV service, SES AMERICOM, filed an application with the FCC to utilize additional orbital slots and to obtain licenses to use the associated bandwidth on the premise that such slots could be squeezed in more tightly. [198] Currently, the government regulations require that satellites be separated from each other by nine degrees; SES AMERICOM argues that 4.5 degree spacing is sufficient, doubling the number of possible spaces for communications satellites. The company had planned to offer a new video platform for content providers to offer programming to households.

In the face of regulatory barriers, SES AMERICOM gave up its competitive quest and instead struck a deal to partner with incumbent DBS provider EchoStar. Now, both companies have pending applications for additional orbital slots.[199]

Even without a new competitor, the use of additional satellites could stimulate competition in both the video and telephony markets. Satellite expansion in the video space would motivate cable operators to respond to competition with expanded systems and packages. This has already driven them to offer telephony to retain customers. Cox pointedly notes that it loses far fewer customers to satellite systems in markets where it provides telephony: "DBS penetration in all of Cox's markets averages just 11 percent. Cox is proud of holding off DBS better than companies like Comcast and Charter do." [200] It attributes its competitive success, in large part, to its bundling of high-quality telephone service.

Rapid settlement of the SES AMERICOM petition filed in April 2002 and the EchoStar petition filed earlier in 2004 could help stimulate this rivalry.

Cable Modems and DSL

Either platform has been regulated, or threatened with regulation, on an "open access" basis. But the market's verdict is clear: deployment of either platform has been strongest where access mandates have been weakest. Vertical integration has proven valuable for the coordination of service provision between cable/broadband and telephony/DSL, and investors creating new services have been well served by rules that allow such coordination. Given the closed nature of a cable modem network, it is revealing that cable modems enjoy a clear advantage over DSL by the existence of open

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[198] Paige Albiniak and Ken Kerschbaumer, *Is DBS Competition in the Offing? SES Americom Says It Is Ready to Enter Market, but First It Must Persuade the FCC to Short-Space Satellites,* BROADCASTING & CABLE (Apr. 29, 2002).

[199] *FCC Ponders DBS Satellite Spacing Issues,* SKYREPORT (Dec. 18, 2003).

[200] John M. Higgins, *Cox Cable Plays Defense and Offense*, BROADCASTING & CABLE (Feb. 2, 2004).

standards in the production of cable modems.[201] With strong incentives for platform owners to promote efficiencies in the equipment that makes up their networks, cable operators have invested to establish highly competitive equipment markets using nonproprietary standards.

Policymakers should declare that all broadband services, including cable modem service and DSL,[202] are "information services" not subject to telecommunications regulation. While this has tentatively been done for cable modem service, policymakers should decisively close the door to broadband regulation generally. This will reduce market uncertainty and improve deployment. With DSL service, the case is even stronger because market share is much less than cable modem service. Only a small fraction of DSL service is provided by an operator other than the local exchange carrier (via an unbundled local loop),[203] and alternative means for independent ISPs to provide DSL over incumbent carrier lines could be negotiated with phone companies or local cable operators in the absence of "open access" mandates. We also propose that, for a limited period of time, Internet service providers be able to provide broadband services by using leased phone loops under TSR pricing rules.

Other Competitive Platforms

Other public policies should be enacted to encourage the emergence of rival telecommunications networks. Promising technologies include broadband over power lines, satellite voice, and satellite broadband. Policymakers should strip away existing or potential regulatory impediments, so that investors have every incentive to fund the risky ventures that may make telecommunications markets more competitive.

REMOVING ECONOMIC DISTORTIONS

The development of competitive telecommunications platforms affords policymakers the opportunity to change the rules. Indeed, some analysts question whether regulation is needed to keep the rates for services down:

> The telecommunications industry is already so roiled by technology-induced tumult, including the proliferation of cell phones and Voice over

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201 An open standard offers a uniform technology that multiple rivals may produce and differs from proprietary technologies that belong to particular firms. In cable modem service, Cable Labs (a cooperative technical venture sponsored by cable operators) coordinates creation of these standard technologies and then certifies that equipment suppliers produce units that meet the specifications. See George Bittlingmayer and Thomas W. Hazlett, "*Open Access": The Ideal and the Real,* 26 TELECOMM. POL'Y 295 (2002).

202 Emerging technologies are important to include. "Regulatory uncertainty over the classification of broadband services could affect broadband over power line (BPL) operations as well, according to industry officials." Dinesh Kumar, *Municipal Utilities Sluggish in Broadband over Power Line Ventures*, COMM. DAILY (June 14, 2004), at 8.

203 Less than 5 percent of residential DSL service was provided by a carrier other than the local exchange operator. See Congressional Budget Office, *Does the Residential Broadband Market Need Fixing?* (Dec. 2003), at 19.

Internet Protocol, that some analysts think regulation is hardly needed to keep prices down.[204]

To strategically position the U.S. telecommunications sector in the global economy, we recommend reforms that require regulatory or legislative action at either the state or federal level. Our reforms fall into two categories: ending polices that discriminate among networks and ending price distortions (including those caused by current measures to support universal service). Our reform proposals will benefit all consumers and generate enormous economic gains.

Eliminating the "Theoretical" Pricing of Network Access

The emergence of rival networks undermines the rationale for network-sharing rules. Policymakers should seize the competitive opportunity now available, as well as the deregulatory option that the legal stalemate over mandatory network-sharing rules has produced.[205] Major regulatory changes to network-sharing rules are likely to occur soon, as the D.C. Circuit ruling earlier in 2004 has rendered the unbundling regime defunct; as of June 15, 2004, the basic framework created by the FCC for determining how incumbents' networks must accommodate new rivals seeking to offer competitive retail telephone service ceased to exist.[206] Forced by the courts, policymakers may now be motivated to make real progress toward procompetitive reforms.

The network-sharing rules in place impose theoretical costs as the rule for compensating sellers in a transaction and are exceedingly ambitious in attempting to impose efficiency by mimicking what an ideally efficient firm would charge. Neither approach helps promote competitive network formation. Theoretical costs do not crosscheck against actual data and are subject to endless debate. Given the collapse of the rules after eight years of arduous effort, it is clear that network sharing has been an immense regulatory burden.

The cost of an existing network *should* send a price signal—a message that invites newcomers to build their own network if they can achieve lower costs. By offering the cost advantages of an ideally efficient firm without the risk of sinking capital, network sharing inherently favors regulation of wholesale markets. Given the evidence that new entrants are not using network sharing as "stepping stones" to building out rival networks, network-sharing mandates have failed to promote true competition.

A simpler, less theoretical pricing model should be used for wholesale access to an incumbent phone carrier's network: one governing the total service resale program is

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204 Ellen Simon, *Rate Rise for Phones Not Certain, Some Say Regulation No Longer Necessary*, HOUSTON CHRON. (June 11, 2004); http://www.Houston Chronicle.com.

205 Jon Van, *Rate Fight Masks Larger Phone Issue; Wireless, Other Options Growing,* CHI. TRIB. (June 11, 2004); Ken Belson and Matt Richtel, *Long-Distance Carriers Take a Blow, but It's No Knockout*, N.Y. TIMES (June 11, 2004); http://www.nytimes.com/2004/06/11/business /11phone.html.

206 Mark Wigfield, *AT&T Plans to Stop Offering Local Service in Some States*, DOW JONES NEWS SERV. (June 15, 2004).

already in place. Under TSR, wholesale rates are based on the regulated retail rate minus the costs avoided by the incumbent when other firms procure and service retail customers. States set these (retail-wholesale) discounts some years ago, and they fall between 15 and 25 percent.[207] This is a tighter range than the discounts awarded to resellers using UNE-P, which recently fell between 14 and 72 percent.[208] As TSR is a requirement imposed by the Telecommunications Act of 1996 that has been enacted, utilized, and not been declared in violation of the act, it offers legal and administrative advantages over an *n*th attempt to determine final UNE rules.

As a practical matter, federal courts have overturned UNE rules, and they now exist on regulatory life support. Using TSR pricing (i.e., "avoided costs") for particular UNEs, such as the local loop, would appear a reasonable alternative if unbundling were a viable entry strategy for firms. With multiple platforms now offering local access, and the mix becoming richer quite rapidly, this does not appear to be the case with respect to the current regulatory regime. In fact, we expect that wholesale offerings will begin to appear in the marketplace, as has already happened with smaller cable companies partnering with VoIP providers like Vonage to supply local telephone service or with AT&T announcing that it will enter the mobile phone market as a nationwide competitor reselling Sprint PCS service once the sale of its physical (AT&T Wireless) network to Cingular is completed.[209] Marketplace deals to share networks will take place in greater degree as legacy network wholesale access pricing rises to market levels.

We propose that unbundled network elements be eliminated, save the local loop, and that the local loop be priced at existing TSR rates. The advantage of an entrant's using the incumbent's loop, instead of the entire voice service, is that the entrant may want to use its own switch (and locate it in the incumbent phone carrier's central office) to provide DSL. Of course, with VoIP, this allows the entrant to provide both voice and high-speed data. It is also important to emphasize the transitional nature of these wholesale rental programs and to phase out network-sharing obligations over a fairly brief interval—three to five years. This would provide further incentives for investment in rival networks and would drive new entrants to more actively seek out emerging competitive platforms with which to partner.

Controversy will meet this proposal, as it will *any serious effort* to promote telecommunications competition. The *New York Times* describes the current situation by quoting industry analyst Scott Cleland: "The Bells and AT&T and MCI scream at the same level whether you are pulling their fingernails out or combing their hair….They have primal screams and that's it."[210] The more important response will be heard from

[207] *How Much Pain from UNE-P*, UBS WARBURG (Aug. 20, 2002), at 6.

[208] Arizona guarantees the lowest discount of 14 percent, while Illinois offers the highest, 72 percent. *Id.* at 14.

[209] "AT&T Corp. announced in mid-May that it will private label services from the Sprint PCS network allowing AT&T to offer wireless service to its more than 30 million business and consumer customers." Khali Henderson, *Sprint under AT&Ts Hood*, PHONE+ MAG. (July 2004) (emphasis in original); http://www.phoneplusmag.com/articles/471resell02.html.

[210] Ken Belson and Matt Richtel, *Long-Distance Carriers Take a Blow, but It's No Knockout*, N.Y. TIMES (June 11, 2004); http://www.nytimes.com/2004/06/11/business/11phone.html.

capital markets, which will embrace the financial opportunities afforded by a reduction in the tax on infrastructure capital, and from service providers, who will race to offer a mix of innovative technologies made possible by advanced telecommunications networks. Emerging networks will gain traction, a very positive outcome for public policy.

Allowing Prices to Be Driven by Costs

Today's universal service policy is fundamentally hostile to competitive telecommunications markets. That is so because it artificially raises certain prices to lower others, and competition has the inevitable effect of eroding price differences not based on true economic cost. Hence, dealing with universal service, while politically difficult, is a necessary part of the telecommunications competition discussion.

We recommend two broad reforms. The first seeks to reduce economic distortions resulting from how universal service funding is raised. The second attempts to lessen distortions resulting from how these funds are spent.

Distribution of universal service support payments. Universal service largely supports rural telephone networks—"high-cost support." Through various mechanisms, rules seek to ensure that the prices customers pay for basic telecommunications services in rural and sparsely populated suburban areas are below market costs. The flow of funds generally supports networks instead of directly aiding individual customers. This means that *high-cost telephone companies* are subsidized by the government, as opposed to the government's *compensating phone users* in high-cost areas. Consequently, universal service as currently constituted is not competitively neutral. This means that firms that qualify for subsidies are favored over others. This has two very negative effects. First, it reduces incentives for suppliers to be efficient, as losses are made up by taxes. Second, it tends to preclude advanced technologies, such as wireless or VoIP, from having an equal opportunity to serve customers, even when such delivery systems are far more efficient than traditional phone service.

The Universal Service Fund should be transformed from an operating subsidy for some network operators into a program that directly aids consumers via vouchers for low-income households. The voucher subsidy amount should be calculated as the difference between the actual cost of a defined set of basic services and the cost of those services in a particular area under current rate regulations. Under our proposal, targeted households would not have to pay more than they currently pay for basic phone service. In fact, given the opportunity competitors would have to serve such "high-cost" households, the net costs paid by customers (retail service charges minus the value of the voucher) would be very likely to fall.

Under a voucher-based universal service system, governmental efforts to ensure that every American has basic phone service would not distort how telecommunications services are provided. Not all rural customers are poor. Those that pay market prices for services would have a strong incentive to choose services that provide the best value. That will drive business to the most efficient providers of telecommunications services.

Ending telecommunications tax distortions. A number of subsidies are generated in telecom markets by artificially raising certain rates for certain classes of services. We propose removing these implicit cross-subsidies and moving to explicit funding mechanisms.

- Long-distance to local support. The long-distance to local subsidy is an explicit part of the access charge paid by long distance carriers to local carriers to terminate a telephone call. The fee charged is currently set at approximately five times the actual cost of terminating the call.[211] *Regulators should recalculate access charges to reflect actual costs or allow charges to be set through private negotiations.*
- Business to residential support. Regulated charges for local phone service for business customers are higher than for residential customers. In 2002 the average business charge for local phone service was $43 per month, but only $23 per month for the same service provided to a residential customer.[212] *Regulated retail phone rates should be phased out to allow service pricing to be market-based.*
- Urban to rural support. State regulators require incumbent phone companies to charge the same price for basic services throughout the entire service area in a state. *Regulated retail phone rates should be phased out to allow pricing to reflect the actual costs of service.*

In addition to these cross-subsidies, the subscriber line charge—a fixed monthly fee applied to all basic phone service that averaged $5.64 per month for residential services in 2002[213]—subsidizes the federal Universal Service Fund. Even this tax creates a distortion because it is applied only to fixed-line phones. We propose eliminating the subscriber line charge.

Our first preference is that future universal service support should come from general tax revenues. This applies to both the Universal Service Fund and any other universal service support government supplies. Such a policy has the advantage of not taxing consumers to subsidize companies or services favored by regulators. Requiring general revenues to support all universal service policies makes the level of support transparent and requires universal service to compete for funds with all other worthy governmental policies.

If funding for universal service must come from telecommunications users, our second preference would be to charge a fixed fee for each telephone number assigned in the United States. Currently, there are approximately 503 million such numbers.[214] As

211 Federal Communications Commission, *In the Matter of Access Charge Reform, Sixth Report and Order*, CC Docket No. 96-262 (May 31, 2000).

212 Federal Communications Commission, Wireline Competition Bureau, Industry Analysis and Technology Division, *Trends in Telephone Service* (May 2004), at Tables 13-1 and 13-2; www.fcc.gov/wcb/stats.

213 *Id.*

214 *Id.*

an example, a $1 per month charge (less than the current subscriber line charge for fixed line phones of $5.96)[215] would generate $6 billion in revenues per year. This fixed fee would make the funds that support universal service competitively neutral.

SUMMARY

Affirmative competition policy provides policymakers an exit strategy to escape the regulatory morass created by implementation of some of the provisions in the Telecommunications Act of 1996. The network-sharing rules and requirements for funding universal service, in particular, have impeded investment in competitive platforms and have adversely affected the ability of the United States to compete globally. We briefly summarize our proposed policy reforms in Table V-E.

Table V-E. Recommended Regulatory Reforms

1. Phase out mandatory network-sharing rules and, more immediately, end regulated wholesale rates set at theoretical costs.
2. Make 438 MHz of prime radio spectrum available for commercial wireless operators.
3. Exempt high-speed cable modem and digital subscriber lines from common carrier regulations.
4. Make Internet services not subject to state phone service regulations.
5. Raise funds for universal service directly from general tax revenues, rather than from hidden costs that penalize telecommunications competition and the growth of network services.
6. Distribute universal service funds directly to targeted consumers.

215 *Id.*

VI
ECONOMIC GAINS FROM DEREGULATION

We first offer approximation estimates to suggest the magnitude of economic effects from proposed reforms. We project that policy changes will increase capital investment within the telecommunications industry by $58 billion and will add $167 billion to GDP over five years. The proposed deregulation could also increase overall productivity growth by 0.25 percent per year as broadband networks extend to smaller companies and more suburban and rural locations. We forecast this productivity increase to add another $467 billion to GDP over five years and to reduce annual inflation (and long-term interest rates) by 0.25 percent. Through the combined effects of both increased investment spending and economywide productivity gains, reform has the potential to raise GDP by $634 billion over five years and to create more than 212,000 new jobs.

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REFORM BENEFITS FOR THE TELECOMMUNICATIONS SECTOR

Of the substantial benefits that would result from the reforms we have outlined, the direct effects on output, employment, and market value for the companies within the telecommunications sector itself are easiest to see. As stated above, telecommunications services and telecommunications equipment companies have been at the epicenter of the economic slowdown and stock market collapse of the past three years. But under the proposed reforms, the telecommunications sector—now heavily burdened by regulations—would return to growth. Our recommended reforms, by improving returns on capital and cash flow for the industry, will encourage capital spending on telecommunications infrastructure.

We have produced point estimates to forecast how the economy would respond to suggested telecommunications policy reforms. These projections, dependent on a range of assumptions, are best considered rough approximations suggesting the magnitude of economic activity that is likely to follow. We find that the deregulation program outlined in Section V could lead to dramatic increases in investment spending, output, and employment in the sector. On the basis of our estimates, the reforms outlined above would generate a total of $58 billion in incremental capital spending for network assets over the next five years by RBOCs, facility-based CLECs, wireless companies, and cable companies.

REFORM BENEFITS FOR THE OVERALL ECONOMY

The proposed changes would also have significant, lasting effects on the overall economy and would benefit all those connected to—but not necessarily employed by—

the telecommunications sector. Virtually all telephone users would reap substantial gains through price reductions. Not only would social goals such as universal service continue to be met, but competitive efficiencies would markedly increase the productive use of telecommunications networks. In particular, U.S. businesses would witness dramatic cost savings in the use of communications technology, as business phone service has been priced artificially high.

Increases in capital spending in one industry also lead to increases in output and employment in other industries—the multiplier effect described in macroeconomics textbooks. Bureau of Economic Analysis multipliers, for example, suggest that each dollar of additional telecommunications capital spending will ultimately generate $2.86 in extra output, while every $1 million rise in telecommunications capital spending leads to 18.2 additional jobs.[216] We estimate that the proposed reforms would stimulate sufficient capital spending to add $167 billion to output and would increase employment by more than 212,000 jobs.

REVIEW OF PREVIOUS STUDIES

A burgeoning literature addresses the economic impact of telecommunications regulations. Economists have taken a wide variety of approaches to assess the impacts of changes in regulations on investment, growth, job creation, and consumer welfare. Although we can only briefly summarize this work, we review a representative sample bearing most directly on our research objective in Appendix III to give the reader some perspective on the variety of approaches available and help put our analysis in context.

ESTIMATING THE IMPACT OF REFORMS ON THE ECONOMY

In this section, we attempt to estimate both industry-specific and economywide impacts of our recommended reforms on the assumption that policymakers promptly implement them. We believe that these impacts would be likely to occur through two channels: (1) the aggregate demand channel of increased investment spending on output, employment, and incomes; and (2) the aggregate supply channel of increased investment on productivity, long-term growth, inflation, and interest rates. Both produce important effects. An estimate of the total impact of telecommunications reforms should consider both sources of economic influence.

Most of the studies reviewed have focused on the demand channel of influence. See Appendix III. Their principal interest is in evaluating the impact of existing or proposed regulations on the investment incentives of one or more telecommunications subsectors—ILECS, facility-based CLECs, cable companies, or wireless companies. The studies then translate the proposed change in regulations into projections of spending on capital equipment and estimate the macroeconomic multiplier, or "ripple effects," that increased capital spending will have on incomes and spending in other parts of the economy.

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216 See http://www.bea.doc.gov/bea/regional/rims/.

Other economists have focused on the impact capital spending has on an economy's long-term growth rate by increasing the quality and amount of productive capital available to workers.[217] Those economists tend to be specialists in macroeconomics or growth theory. Their interest is in explaining increased labor productivity—output per hour of work—the principal driving force behind increases in living standards over time.

With the caveat that it is not possible to represent adequately the work of so many scholars on such broad and difficult subjects, we attempt to account for the principal themes from both approaches in our work. Demand-driven multiplier effects are especially relevant in a depressed sector in which ample supplies of slack resources exist, as is the case in the telecommunications sector today. Multiplier effects on output and employment, however, are unlikely to be permanent. They last only as long as the capital spending stimulus is active and as long as the economy has slack resources. At full employment, further stimulus would be more likely to increase prices than output.

It is also important to note that some of that investment assumed to take place over five years in response to policy reforms could take place, beyond the five-year window we analyze, without policy reform. We do not attempt to net out such possible offsets. In contrast, however, supply-driven productivity effects are long-term in nature. Increases in the capital stock raise output per hour of work over the life of the capital, which can be many years. And increases in the capital stock raise productivity, reducing costs and prices—while improving profits—in the long term. An additional caveat is important: the estimates offered here project gains over a five-year period when deregulatory policies encourage increased investment.

ANALYTICAL APPROACH

We take a fundamental value-oriented approach to analyze the impact of a regulatory change on the capital spending behavior of the telecommunications sector. Our analysis is based on the notion that managers are driven by their obligations to

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217 See, for example, Robert M. Solow, *Technical Change and the Aggregate Production Function,* 39 REV. ECON. & STAT. 312 (1957); Dale W. Jorgenson, *American Economic Growth in the Information Age,* PROGRESS ON POINT (Progress and Freedom Foundation, 2002), at 9; Dale W. Jorgenson, *Productivity and Economic Growth* in ERNST BERNDT AND JACK E. TRIPLETT, EDS., FIFTY YEARS OF ECONOMIC MEASUREMENT (Univ. of Chicago Press, 1990), at 19–118; Dale W. Jorgenson, M. S. Ho, et al., *Lessons from the US Growth Resurgence,* 25 J. POL'Y MODELING 453 (2003); Stephen D. Oliner and Daniel E. Sichel, *Information Technology and Productivity: Where Are We Now and Where Are We Going?* 25 J. POL'Y MODELING 477 (2003); Dominick Salvatore, *The New Economy and Growth: Editor's Introduction,* 25 J. POL'Y MODELING 431 (2003); Kevin J. Stiroh, *Measuring Information, Technology, and Productivity in the New Economy*, 3 WORLD ECON. 43 (2002); Barry P. Bosworth and Jack E. Triplett, *Services Productivity in the United States: Griliches' Services Volume Revisited,* CRIW Conference in Memory of Zvi Griliches, Brookings Institution (2003); Jason G. Cummins and Giovanni L. Violante, *Investment-Specific Technical Change in the United States (1947–2000): Measurement and Macroeconomic Consequences,* 5 REV. ECON. DYNAMICS 243 (2002); ROBERT E. LITAN AND ALICE M. RIVLIN, THE ECONOMIC PAYOFF FROM THE INTERNET REVOLUTION (Brookings Institution Press, 2001).

preserve and grow the value of their shareholders' capital.[218] Thus, they take advantage of opportunities to make investments that increase shareholder value by deploying new and existing capital in activities that will generate a return on capital higher than their cost of capital, which represents the opportunity cost of their shareholders' funds. Investors will highly prize firms that consistently generate returns greater than the cost of capital; their shares will tend to be valued in excess of the value of their capital.[219]

Specifically, we use an intrinsic value framework to estimate the value of firms. This approach estimates the intrinsic value of a firm by projecting the financial statements of a firm—including its revenue stream, costs, profits, taxes, and capital requirements—far into the future. The objective is to produce an estimate of the firm's free cash flow—the after-tax cash profits available to fund new investments or to pay out to investors—for each future year. We find the estimate by subtracting both taxes and additional capital requirements from cash operating profits. This projected free cash flow stream is discounted back to present value at the firm's weighted average cost of capital to estimate the total enterprise value of the firm. Enterprise value less total outstanding debt and other obligations equals the intrinsic value of the firm's equity.

In this intrinsic value framework, changes in government regulations affect capital spending decisions within a firm by altering one of the many "value drivers" (such as sales growth, prices, costs, profit margins, capital requirements, or tax rates) that determine the return on invested capital. These value drivers, in turn, can be broken down into the factors that influence a firm's after-tax free cash flow—its cash profits from doing business—and those that influence the amount of capital the firm requires to undertake an investment.

Telecommunications regulations can affect both cash flow and capital requirements. Unbundling requirements combined with prices set below actual costs reduce the price and the profit margin of the network owner. The result is a lower return on capital, which reduces the intrinsic value of the firm in the capital markets. If the resulting return is below the firm's cost of capital, managers will have incentives to reduce capital spending, buy back stock, or return capital to owners through increased dividends, to preserve shareholder value.

This textbook explanation of investment decisions is, of course, highly simplified. In the real world, managers have to live with informed guesses about the variables they

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218 Capital refers to the funds the firm uses to establish, grow, and operate. In general, a firm can create value for its debt and equity investors only when it earns an after-tax return on invested capital (ROIC) higher than its weighted-average cost of capital (WACC), the opportunity cost of investors' funds in other uses. For a discussion of this approach and examples of how to calculate capital, see T. COPELAND, T. KOLLER, ET AL., VALUATION: MEASURING AND MANAGING THE VALUE OF COMPANIES (John Wiley, 2000).

219 The ratio of the value of a firm to the value of its capital is known as the *Q*-ratio. We refer to the ratio of a firm's intrinsic value to the value of its capital as the warranted *Q*-ratio. The firm's ROIC strongly influences this value. According to intrinsic value methods, if a firm earns an ROIC equal to WACC, then the firm will have a warranted *Q*-ratio of 1.0; that is, each dollar of capital the firm invests produces exactly a dollar of value for shareholders, so the firm creates no value for investors.

need to account for to fully assess the value-creating potential of a given investment. By and large, most managers make an honest attempt to do so, and both board rooms and financial markets widely accept the basic economic logic.

Specifically, we analyze the impacts of our recommended reforms on RBOCs, CLECs, cable companies, and wireless companies to identify the most important factors altering returns, revenue growth, profit margins, and capital requirements.

We examine the historical distributions for the most important value drivers to make the assumptions to project future cash flows and returns and establish a baseline projection for the amount of capital investment that would take place in the absence of policy change. We then rerun the analysis after evaluating the impact of proposed regulatory changes on the key value drivers to determine the likely impacts on telecommunications investment spending.

We then use a set of multipliers from standard macroeconomic analysis to estimate the impact of changes in telecommunications capital spending on output and employment for the U.S. economy as a whole.

Finally, we estimate the impact the recommended reforms might have on U.S. productivity growth. We then combine the multiplier and productivity effects to produce an estimate of the overall effect on economic output and jobs.

ILEC INVESTMENT

Incumbent telephone companies invested nearly $300 billion in landline network assets between 1992 and 2003, a sum accounting for 49 percent of wireline investments, 41 percent of all wireline and wireless investments, and 37 percent of all telecommunications investments (including those made by cable television companies). Historically, RBOCs have accounted for more than 90 percent of ILEC investments and serve a still greater percentage of leased UNE lines. For that reason and because of data availability, we focus on the RBOCs' landline investments when estimating the impact of our UNE reforms on capital spending.

Building and operating a local telephone network is capital-intensive. During the 1982–2002 period the RBOCs have, on average, deployed between $2.50 and $2.75 in capital to generate each $1.00 in annual sales.[220] These capital expenditures have two primary components. First, funds are invested to maintain existing networks, which can be interpreted as replacing the economic depreciation of plant and equipment. Investment beyond the level required to maintain the current network increases capacity to grow revenue from services sold directly to end-users and to build and maintain the capacity required to serve wholesale customers.

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220 The inverse of this calculation is known as capital turnover—0.40 in this example. It expresses the number of dollars of sales a firm generates per dollar of capital. Rutledge Capital calculations (May 2004); COMPUSTAT Database Research Insight; Standard & Poors CD ROM (Apr. 2004).

1985–1995 BASE PERIOD

We use 1985–1995 as a base period to analyze the ratio of capital expenditures to sales. Between 1985 and 1995, RBOCs were authorized to provide only local telephone service. The firms faced comparatively few unbundling requirements. They did not yet have significant competition from wireless or cable companies, and they enjoyed relatively stable revenue growth of 4 percent per year. The result was a ratio of capital expenditures to sales of about 21 percent[221] with low year-to-year variance. Most of this capital expenditure, between 15 percent and 20 percent, was devoted to network maintenance; the residual funded growth.

The more recent period is considerably different. See Table VI-A.[222]

Table VI-A. Wireline Operating Segment Statistics for BellSouth, Verizon, Qwest, and SBC: 1998–2003

	1998	1999	2000	2001	2002	2003
Sales Revenue	$103,393	$107,003	$113,979	$117,987	$111,463	$107,879
Capital Expenditures	$22,868	$26,437	$34,048	$34,783	$18,883	$16,351
Capital Expenditures/Revenue	22.1%	24.7%	29.9%	29.5%	16.9%	15.2%

Note & Sources: Revenues and capital expenditures are in $ millions. Company annual reports, SEC Form 10-K filings, various dates, and Rutledge Capital calculations (May 2004).

Broadband buildouts drove the dramatic increase in the RBOC capital expenditure/revenue ratio from 1998 to 2001. For instance, SBC spent approximately $3.2 billion during this period on Project Pronto, which yielded 1.3 million DSL subscribers and the capability to deliver DSL to 25 million households.[223] Qwest expanded its data network capabilities with substantial investments in fiber-optic plants. Profits from these and other investments, however, proved elusive and led to a 50 percent reduction in capital spending per dollar of revenue between 2001 and 2003. This reduction in spending included cancellation of Project Pronto by SBC, which reported to shareholders:

> During the third quarter of 2001, due primarily to an adverse and uncertain regulatory environment, we began a slowdown of the capital expenditures to build our national broadband network, which includes fiber, electronic and other technology.[224]

221 This ratio was slightly higher (23.4 percent) for all companies reporting to the FCC as ILECs. Rutledge Capital calculations (May 2004); COMPUSTAT Database Research Insight; Standard & Poors CD ROM (Apr. 2004).

222 To look at the changes to the wireline business of the RBOCs over this period, we use operating segment data provided by the companies in public filings. These data typically divide major financial statistics into wireline, wireless, international, and other.

223 SBC Communications, SEC Form 10-K, December 31, 2001.

224 *Id.*

BASELINE CASE

To estimate RBOC capital investment in our baseline case, which assumes that current regulations remain in force, we make the following assumptions:

1. No change occurs in regulations regarding UNE-P terms and conditions, or in access requirements for high-speed (DSL) data networks.

2. Annual wireline revenue grows 0 percent over the next five years. (This reflects increased competition from wireless carriers and competitive providers of wireline services.)

3. No major new projects add DSL or fiber network capacity.

4. The capital expenditures/revenue ratio increases from 15.2 percent in 2003 to approximate maintenance levels of 17.5 percent.[225]

5. CLECs continue to increase their market share of the local market from approximately 12 percent in 2003 to 20 percent in 2008.

6. RBOCs protect market share by bundling long-distance with local services.

Table VI-B. RBOC Baseline Capital Spending: 2005–2009

	2005	2006	2007	2008	2009	Total	Average
Wireline Revenues	$107,879	$107,879	$107,879	$107,879	$107,879	$539,395	$107,879
Capital Expenditures	$18,879	$18,879	$18,879	$18,879	$18,879	$94,395	$18,879
Capital Expenditures/Revenues	17.5%	17.5%	17.5%	17.5%	17.5%	17.5%	17.5%

Note & Source: Revenues and capital expenditures are in $ millions. Rutledge Capital calculations (May 2004).

In our baseline case, RBOC landline revenues remain at the 2003 level of $107.9 billion (see Table VI-B) throughout the next five years. That represents a situation in which overall growth in the telecommunications sector is offset by increasing penetration of wireless and cable telephony services and increasing CLEC market share. RBOCs invest an average of 17.5 percent of revenues, or $18.9 billion per year, in landline network assets. Total investments over the five-year period equal $94.4 billion.

This baseline case is not our most likely forecast, but it is a plausible estimate of what would happen were regulations to remain frozen. We compare this outcome with the results of alternative scenarios.

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[225] It is important to keep in mind that no reasonably precise way exists to estimate the required level of maintenance capital spending. We have chosen 17.5 percent of revenues as the midpoint of the 15–20 percent of revenues that is frequently discussed in analyst reports. We have had conversations with analysts, however, that suggest that this number could be as low as 13–15 percent. In using 17.5 percent, rather than a lower number, we are being conservative, in the sense that lower numbers in the baseline case would imply a larger net impact from reforms.

Under our recommended reforms, CLECs will continue to have the option to use the copper loop between central offices and end-users, known as ILEC "last mile" facilities, for some period of time. They will, however, pay prices that approximate the prorated cost the ILEC incurs in providing its existing network, referred to in earlier sections of this report as TSR rates, rather than hypothetical TELRIC prices. This change would increase revenues and profit margins for ILEC network owners and would increase lease payments that UNE-based CLECs make to ILECs by a similar amount. The benefits of this change would accrue to network owners. The resulting increased returns on capital for RBOCs would lead to an increase in RBOCs' capital spending.

To estimate the impact of UNE reform on RBOC capital investment, we make the following assumptions:

1. Wholesale network lease rates are increased to approximate actual embedded costs. We model this as a 37.5 percent increase from current levels.[226]

2. All existing leased lines, including UNE-P, UNE-L, and TSR lines, remain in place during our forecast period.[227]

3. RBOC revenues and pretax profits rise by $1.88 billion per year as a result and increase return on capital.[228]

4. RBOC capital spending increases to the historical average capital expenditure/revenue ratio of 21 percent to reflect the higher return on capital.

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226 The 37.5 percent figure is consistent with recent analyst comments regarding the increasingly competitive market for local phone services. See, for example, A. Latour and S. Young, *Rules Change Could Alter the Fate of Long-Distance Giants*, WALL ST. J. (June 11, 2004), at B1; B. Charny, *Chief Justice Rejects Telecom Case*, CNETNEWS.COM (June 14, 2004); www.news.com/2100-1037-5233301.html. Other authors have reported a higher estimate, for example, Jeffrey A. Eisenach and Thomas M. Lenard, *Telecom Deregulation and the Economy: The Impact of "UNE-P" on Jobs, Investment, and Growth*, Progress and Freedom Foundation (Jan. 2003), at 18.

227 In fact, we would expect the increase in lease rates to trigger a number of changes. Higher rates would inhibit the ability of CLECs to attract customers by offering large discounts, which would result in some degree of migration of customers back to RBOCs over time. Higher lease rates would also induce some CLECs to build their own facilities. Unfortunately, we have no reliable estimates of these changes.

228 Rutledge Capital calculations (May 2004); COMPUSTAT Database Research Insight; Standard & Poors CD ROM (Apr. 2004). This increase in after-tax profits is lower than some recent analyst estimates and reflects our conservative use of a 37.5 percent increase. See, for example, T. Horan and S. Anantha, *Telecom Services: Solicitor General & FCC Majority Won't Appeal UNE-P Overturn; Potential Earnings Boost to the RBOCs Underestimated by the Market*, CIBC EQUITY RESEARCH INDUSTRY UPDATE (2004); P. S. Brogan and S. C. Cleland, *How UNE-P Fuels the Fire of Telecom's Competitive Intensity*, PRECURSOR GROUP (2003); Merrill Lynch, *Triennial Review Order Largely Sustains the Regulatory Status Quo—A US Telecom Snafu?* TELECOMMUNICATOR (2003).

Table VI-C presents our estimates of the impact of our recommended UNE reforms on RBOC capital spending over the next five years.

Table VI-C. Incremental Capital Spending Due to Proposed UNE Reforms: 2005–2009

	2005	2006	2007	2008	2009	Total	Average
Revenues	$109,754	$109,754	$109,754	$109,754	$109,754	$548,770	$109,754
Capital Expenditures	$19,756	$20,853	$23,048	$23,048	$23,048	$109,753	$21,951
Capital Expenditures/Revenues	18.0%	19.0%	21.0%	21.0%	21.0%	–	20.0%
Incremental Capital Expenditures	$877	$1,974	$4,170	$4,170	$4,170	$15,360	$3,072

Notes & Source: Revenues and capital expenditures are in $ millions. Total capital expenditures do not equal the sum of capital expenditures because of rounding. Rutledge Capital calculations (May 2004).

Substituting "avoided cost" pricing for TELRIC-priced UNE-P would raise wholesale prices by approximately 37.5 percent. This would increase RBOC landline revenues by approximately $1.88 billion in each of the next five years, which would stimulate an additional $15,360 million in capital expenditures by the RBOCs over the next five years, an increase of $3.1 billion per year.

Market Values

As described above, we calculate intrinsic value as the net present value of the estimated future free cash flows (net operating profit after tax, or NOPAT, less capital expenditure) of the firm, minus debt. This is different from the observed market value, which is the price at which equity shares trade. Over time, market prices tend to converge to their intrinsic values, but there is no assurance that this will occur within any given time frame.

The network-sharing reforms would have a significant impact on RBOC intrinsic values by raising their revenues without materially raising their costs and would thus raise their profits as well. Revenues increase by $1.88 billion per year as a result of the shift from TELRIC to TSR pricing. If we assume no change in the number of CLECs using leased lines, operating profits before tax would rise by the same amount.[229] RBOCs pay (using an eighteen-year sample) an average cash tax rate of 30.8 percent.[230] This implies that annual net operating profits after taxes would increase by (1 − .308) X ($1.88 billion) = $1.30 billion.

Next, we must translate the $1.30 billion annual increase in NOPAT into free cash flow by subtracting incremental capital costs required to support the additional revenues. Although we see no reason why the change in lease rates would affect inventories or payables, accounts receivables should increase to reflect the higher revenues. The RBOCs' 2003 year-end balance sheets report 73.5 days of receivables, which implies that receivables were 20.4 percent of sales. If we use that figure as our estimate of additional

229 We assume an increase in revenues with no incremental costs to obtain the resulting increase in operating profits.

230 Rutledge Capital calculations (May 2004); COMPUSTAT Database Research Insight; Standard & Poors CD ROM (Apr. 2004).

working capital required to support a dollar of sales increase, we can estimate that in the first year firms will use 20.4 percent, or $0.265 billion of the $1.30 billion NOPAT increase, to provide additional working capital, leaving $1.035 billion in additional free cash flow. In the second year and beyond, however, the entire $1.30 billion would drop into increased free cash flow, since there is no further increase in sales or required working capital.

An estimate of the average after-tax cost of capital (WACC) for the RBOCs is 7.38 percent.[231] At this discount rate, the $1.30 billion increase in NOPAT increases the intrinsic enterprise value of the RBOCs by $14.0 billion. By the end of the fifth year, intrinsic equity value would increase by $17.6 billion less the $0.265 billion increase in working capital, plus the accumulated after-tax profits during the five years of $6.24 billion, or $23.6 billion.

While it is important to note that the increase in leased-line charges would decrease NOPAT for CLEC resellers, CLEC market value changes would not offset ILEC gains. That is seen in the near-zero value attached to CLEC resale models before reform and is explained by the fact that reseller profitability with regulated retail/wholesale margins are unsustainable.[232]

CLEC Investments[233]

Facilities-based CLECs should also increase capital spending as a result of our proposed reforms. We use the midpoint of estimates from two research papers—one by Robert W. Crandall, Allan T. Ingraham, and Hal F. Singer, the other by James Eisner and Dale E. Lehman[234]—which imply that instituting policies similar to our wholesale access reform proposals would increase CLEC investment by $2.7 billion. We have distributed the additional $2.7 billion in CLEC network investments uniformly over the five-year period as $540 million per year.

BROADBAND REFORM AND DSL INVESTMENT

Our next set of reforms are designed to stimulate investment in high-speed telecommunications networks by classifying new DSL, cable, and VoIP investments as information services, which are not subject to unbundling or other regulatory obligations. CLECs would still have access to the high-frequency portion of the incumbent's existing

231 Raul L. Katz and Carolina Junqueira, *Managerial Strategies and the Future of ROIC in Telecommunications,* Booz, Allen, Hamilton (2003).

232 Thomas W. Hazlett, *The Irony of Regulated Competition in Telecommunications*, 4 COLUM. SCI. & TECH. L. REV. 1 (2003); Thomas W. Hazlett and Arthur M. Havenner, *The Arbitrage Mirage: Regulated Access Prices with Free Entry in Local Telecommunications Markets*, REV. NETWORK ECON. 440 (Dec. 2003).

233 We exclude cable operators here and consider their investments in the following subsection.

234 James Eisner and Dale E. Lehman, *Regulatory Behavior and Competitive Entry,* 14th Annual Western Conference, Center for Research in Regulated Industries (June 28, 2001); Robert W. Crandall, Allan T. Ingraham, and Hal J. Singer, *Do Unbundling Policies Discourage CLEC Facilities-Based Investment?* 4 TOPICS IN ECON. ANALYSIS & POL'Y 1 (2004).

local loop. This means that ILECs would be able to make new investments in remote nodes and fiber-optic lines without facing unbundling requirements. Eliminating unbundling obligations for new investments is key to the incentives to make important capacity-expanding extensions of existing networks.

We make the following assumptions to estimate the impact of broadband reform on RBOC high-speed network investments:

1. Regulations are changed and clarified so that the incumbent phone operators are paid historical costs for access to their network elements.

2. Legacy networks are not required to provide third-party access to advanced technologies such as fiber loops or DSL facilities.

3. These changes are effective at the beginning of 2005.

4. ILECs respond by reinstating plans to upgrade and expand broadband networks.

5. ILECs ramp up their capital expenditures/sales ratio to a peak of 23 percent in 2007 to reflect higher returns on capital.

6. DSL's share of residential broadband increases from 39 percent in 2005 to 45 percent in 2009.

7. 69 million households subscribe to cable modem or DSL service by 2009.

8. DSL revenues per subscriber average $55.21 per month in 2005 and decline to $48.68 in 2009.[235]

We estimate the impact of reforms on DSL capital spending by first specifying a baseline DSL adoption path to acknowledge that we would see growing numbers of DSL subscribers, even if no further reforms were to take place. We use the Yankee Group's recent projections of DSL and high-speed cable subscribers.[236] This forecast, shown in Figure VI-A, has DSL subscribers increasing from 7.2 million in 2003 to 21.2 million subscribers in 2008, with 51.3 million total broadband subscribers in 2008. We extrapolate the Yankee Group's forecast one year to 2009, when we assume 23.1 million DSL subscribers and 56.4 total broadband subscribers.

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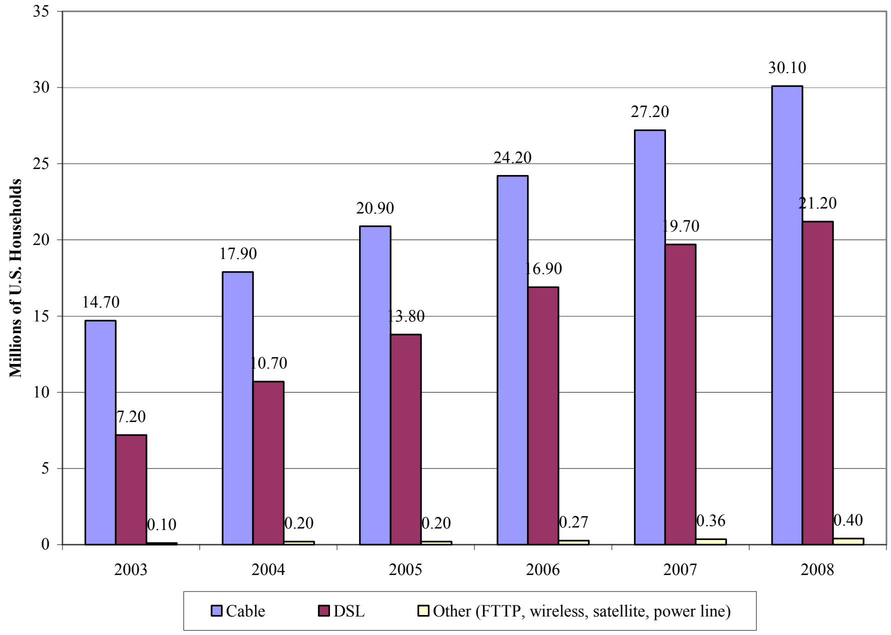
235 This includes both residential and business DSL customers. We have used Telecommunications Industry Association projections for the average monthly DSL fee through 2007, which we have extended through 2009 by decreasing monthly revenues by 3.3 percent per year in 2008 and 2009. Telecommunications Industry Association, *TIA's 2004 Telecommunications Market Review of Forecast*, (2004), at 115.

236 Yankee Group, *Broadband Subscriber Forecast* (2004); http://www.yankeegroup.com/public/products/research_note.jsp?ID=11720.

Figure VI-A. U.S. Baseline Broadband Subscriber Growth: 2003–2008



Note & Source: FTTP = fiber to the premises. Yankee Group (2004); http://www.yankeegroup.com/public/products/research_note.jsp?ID=11720.

We estimate the addition to ILEC revenues and capital spending that would occur if DSL subscriber growth were given by the baseline projections. Then we estimate the subscribers, revenues, and capital spending in our reform case. If policy changes are quickly implemented, we assume that 2009 broadband subscribership (cable modems plus DSL) will increase from 56.4 million to 69 million. Our baseline estimate of 56.4 million subscribers is approximated from recent analyst projections.[237] We have conservatively assumed that deregulation will increase cable modem and DSL subscribers by 5 million each, to generate a combined increase of 10 million broadband subscribers. We attribute each year's added subscriber increment to the impact of reform. Table VI-D presents estimates of the impact of proposed reforms on ILEC DSL capital spending over the 2005–2009 period.

Table VI-D. Incremental Capital Spending on DSL Due to High-Speed Information Services Reforms: 2005–2009

	2005	2006	2007	2008	2009	Total	Average
Additional Revenues	$1,193	$2,087	$2,639	$3,673	$4,644	$14,236	$2,847
Incremental Capital Spending	$239	$438	$607	$808	$975	$3,067	$613

Note & Source: Figures are in $ millions. Rutledge Capital calculations (May 2004).

237 Morgan Stanley, *What Does the Market Expect?* (Apr. 8, 2004), at 43 and 45.

On the basis of these estimates, classifying DSL as an information service and eliminating unbundling on DSL investments, in addition to the unbundling regulation reforms analyzed in the previous section, would increase ILEC investment in DSL network capacity by an additional \$3.1 billion over the next five years, an average of \$613 million per year above the baseline trend.

The additional DSL capacity would increase the number of DSL subscribers to 31.1 million by 2009, which would increase ILEC revenues by an average of \$2.8 billion per year, or \$14.2 billion over the five-year period. The increase in annual revenues in 2009 of \$4.6 billion per year equals 1.5 times the cumulative increase in capital over the five year period, a significant improvement in capital turnover from the approximate 0.58 percent average sales-to-capital ratio over the 1993–2003 period.[238]

Market Values

The DSL reforms would also have a significant impact on the value of RBOC equities. As we have noted, RBOC revenues increase by \$4.6 billion per year in the fifth year of our projections as a result of adding DSL customers. The 2003 ratio of NOPAT to sales of 18.2 percent implies a \$0.84 billion increase in NOPAT in 2009. The 7.38 percent WACC figure we use implies an \$11.3 billion increase in the total enterprise value of RBOCs. Intrinsic equity value should rise by approximately \$11.3 billion less the \$3.1 billion increase in capital required to add the capacity, plus the accumulated after-tax profits earned during the five years, which amounts to \$12.4 billion,[239] in addition to the \$23.6 billion increase in intrinsic value due to the wholesale pricing changes. Together, these reforms imply a \$36.0 billion increase in RBOC intrinsic value by the end of the fifth year.

Cable Operator Investments

The reforms should also have significant impacts on investments in both high-speed data (cable modem) and cable telephony by cable companies. As discussed, cable companies have been deterred from making incremental investments to deliver full-service telephony, in part because of regulatory disincentives. Eliminating below-cost wholesale prices for resellers and classifying cable networks as information services would unleash investments in both high-speed data (cable modem) and cable telephony.

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238 This suggests that our estimates are conservative when compared with historical capital needs and implies that the network investments that have already been made would allow the companies' revenues to rise with substantially less incremental capital than has been historically necessary. Rutledge Capital calculations (May 2004); COMPUSTAT Database Research Insight; Standard & Poors CD ROM (Apr. 2004).

239 This estimate would increase substantially if investors were to revise their estimates of RBOC profit growth rates, as we might expect in this case.

High-speed data services represent a significant area of revenue growth for cable companies.[240] We use the Yankee Group forecast that cable modem subscribers will increase from 14.7 million in 2003 to 30.1 million in 2008 and extrapolate one year to 33.3 million subscribers for 2009 as our baseline assumption for subscribers to high-speed data services. We assume that cable company high-speed data capital expenses of $50 per subscriber in 2005 decline to $35 per subscriber in 2009.[241]

We estimate the incremental impact of our reforms on cable modem capital spending by projecting the number of subscribers in the reform case and then applying the same per-subscriber capital spending costs above. Our reform case assumes that cable modem subscribers will increase to 38 million, or 4.7 million over the baseline trend (Yankee Group). The result is $713 million of incremental capital spending attributable to reform over the five-year period, or $143 million in additional capital spending per year.

Cable telephony investment is also likely to increase with reforms. By the end of 2003, telephone-ready cable passed 16.4 million of the total 111 million homes in the United States.[242] On the basis of estimates from Cox Communications,[243] it would cost an additional $267 in capital spending per household to supply VoIP service virtually equivalent in quality and reliability to standard telephone service.

In our baseline case, we assume that cable operators make one-half of the remaining market telephony-ready by 2009. In our reform case, we assume that cable companies make the entire market telephony-ready by 2009. The incremental impact of the reforms, then, is the difference between the two cases. We use 95 percent of the 121 million total households in 2009,[244] or 115 million households, as a measure of the total universe of households in cable TV areas in 2009. That implies that 98.6 million households are still to be passed by cable telephone lines. Half that number equals 49.3 million homes. The cost of making those 49.3 million homes telephony-ready by 2009 at $267 per subscriber is $2.6 billion, an average of $527 million per year. See Table VI-G, which appears later in this section.

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[240] A recent Morgan Stanley report states that high-speed data services will account for 40 percent of cable revenue growth over the next several years. See Richard B. Bilotti, Benjamin Swinburne, et al., *What Does the Market Expect*? MORGAN STANLEY CABLE/SATELLITE INDUSTRY OVERVIEW (2004).

[241] This figure is the sum of capital expenditures for high-speed data maintenance per subscriber plus the annual cost of high-speed data consumer premises equipment, assuming the average equipment life of five years. Richard B. Bilotti, Benjamin Swinburne, et al., *Truth, Lies, and Truck Rolls: Understanding Product Profitability*, Morgan Stanley (2002), at 8, Exhibit 3.

[242] LEICHTMAN RESEARCH GROUP, RESEARCH NOTES (First Quarter 2004).

[243] Cox Communications, White Paper, *Voice over Internet Protocol: Ready for Prime Time* (May 2003); http://media.corporate-ir.net/media_files/IROL/76/76341/May_whitepaper_2.pdf. Cox projects that 20 percent of households passed subscribe to telephone service from the cable operator. *Id.* at 11. The $267 figure refers to VoIP deployment, which is less costly than circuit-switched deployment costs of $527 per customer. We have used the $267 figure as a conservative estimate.

[244] Robert W. Crandall, Hal F. Singer, and Charles L. Jackson, *The Effects of Ubiquitous Broadband Adoption on Investment, Jobs, and the U.S. Economy,* Criterion Economics (Sept. 2003).

Broadband Consumer Surplus

Consumer surplus is a measure of how much value consumers place on a good or service above what they actually pay for that product. Estimates of consumer surplus depend on the amount of a product being consumed, on the price being paid, on the sensitivity of consumer demand to changes in the price of the product (what economists call price elasticity of demand), and on the overall shape of the demand curve. Other researchers' estimates suggest that the elasticity of demand for broadband services is somewhere between –1 and –1.5.[245] We use the –1 figure and assume that the demand curve is linear. We also assume a top-end value for broadband services of $120 per month, a price above which no consumer would purchase the service.[246]

Given these assumptions and the prices and quantities implicit in our revenue figures above, we estimate that deregulatory gains in consumer surplus in broadband services would range from $4.5 billion in 2005 to $12.9 billion in 2009, for a cumulative benefit of $42.7 billion. See Table VI-E. We estimate that for every additional dollar that monthly subscription prices are reduced for DSL or cable modem service, cumulative consumer surplus would increase by an additional $3.8 billion over the next five years.[247]

Table VI-E. Broadband Consumer Surplus Estimates: 2005–2009

Year	Households	Households with Broadband	Total Additions to Broadband Consumer Surplus	Baseline Growth Additions to Consumer Surplus	Incremental Consumer Surplus Due to Reforms
2005	114.6	39	$10.30	$5.90	$4.50
2006	116.2	48	$18.70	$12.10	$6.60
2007	117.8	55	$25.80	$17.70	$8.10
2008	119.5	62	$32.60	$22.00	$10.60
2009	121.1	69	$39.30	$26.40	$12.90
Cumulative			$126.80	$84.10	$42.70

Notes & Source: Households are in millions. Consumer surplus is in $ billions. Additions to consumer surplus are accurate to the nearest 10¢. Cumulative additions to broadband consumer surplus do not equal the sum of additions to broadband consumer surplus because of rounding. Rutledge Capital calculations (May 2004).

Spectrum Reform

Our spectrum policy reforms would be likely to produce major economic benefits. In particular, expanding the quantity of bandwidth the FCC allocates to commercial users would dramatically drive down costs per minute and would greatly increase the number of wireless minutes consumed. This change would substantially increase consumer welfare and intensify competition in both voice services and broadband Internet access.

245 *Id.* at 7.
246 Crandall, Singer, and Jackson use a similar assumption.
247 Our estimates are somewhat higher than the Crandall, Singer, and Jackson estimates over the same years, principally because we have more recent 2003 figures for both broadband subscribers (+2 million) and penetration rates (+3.5 percent) than were available to them.

On the basis of an analysis done in preparation of recent testimony by one of the authors before the Senate Commerce Committee, allowing wireless operators to use an additional 200 MHz of radio spectrum would lower per-minute wireless charges by about 50 percent, from about 11.2¢ per minute (estimated under market conditions existing at year-end 2003) to 5.6¢ per minute and would lead subscribers to increase usage by 95 percent. This would generate $77.4 billion per year in additional consumer surplus. [248]

Our discussion of U.S. spectrum regulation in Sections IV and V points out that the amount of spectrum available to commercial wireless networks is woefully inadequate, compared with both allocations in other countries and the extremely high value placed on additional bandwidth by telecommunications users *relative to* the values obtained currently in the use of alternative frequencies.

In this section, we estimate the economic impact of adding 200 MHz of spectrum to existing allocations to illustrate the magnitude of the benefits spectrum reform could bring to consumers. We have chosen an additional 200 MHz for our calculations, rather than the additional 438 MHz we recommend in Section V, for three reasons. First, we want to provide a conservative estimate of what spectrum reform might bring about. Second, according to industry sources, the additional 200 MHz is an allocation that the wireless industry has indicated would help complete nationwide roll-out of third-generation wireless services.[249] Some wireless carriers have begun this transition, but they are severely constrained in terms of additional spectrum requirements. Third, an additional 200 MHz to wireless telecommunications licenses would bring the U.S. allocation up to the top end of the range now seen in the European Union. Note, however, that the use of this increment for analytical purposes does not imply that additional spectrum (beyond this increased bandwidth) would not benefit the U.S. economy.

Additional spectrum would affect the companies in the wireless market in a number of ways, not all of them positive. The wireless license auction itself would significantly reduce the price of bandwidth access from its current level—approximately $1.65 per MHz per person, or about $560 million per MHz for a nationwide license—which has been kept high, in part, through policy-induced scarcity. Existing licensees would likely see a decline in the value of their intangible assets. Although we would not expect these noncash losses initially to affect the cash flow of wireless operators, the resulting decline in net worth could have at least temporary negative effects on their credit availability[250] and growth.

[248] Thomas W. Hazlett, *Exit Strategies for the Digital TV Transition*, U.S. Senate Commerce Committee (June 9, 2004). See also Thomas W. Hazlett and Roberto Muñoz, *A Welfare Analysis of Spectrum Allocation Policy,* Manhattan Institute for Policy Research (June 10, 2004).

[249] Telecommunications Industry Association, *TIA's 2004 Telecommunications Market Review of Forecast* (2004), at 152.

[250] Loan agreements between lenders and business borrowers often contain negotiated parameters known as covenants, measuring the financial condition of the borrower, that specify the rights of either party in specific circumstances. One such covenant, the net worth test, states that in the event the ratio of a company's net worth to its total debt falls below a stated level, the lender will acquire specified additional rights, which may include the right to unilaterally reduce the size of the company's credit

The reduction in license costs would also produce dramatic positive effects on the operations of wireless providers. Firms would be able to acquire licenses at greatly reduced costs. This reduction in cost would lead to an increase in the after-tax return on capital for both new and existing firms and would induce wireless companies to undertake investments to increase the scale of their businesses.[251] The resulting increase in capacity would drive prices down and increase minutes of use.[252]

Estimating the impact additional spectrum availability would have on capital spending, however, is a difficult matter. We do not have adequate evidence from history to allow us to understand how reductions in license prices would affect the operating costs, credit availability, or operating and investment decisions of wireless companies, inputs we need to make a reliable point estimate of capital spending. By way of historical analogy, however, we can gain a rough estimate by using the experience from the most comparable past period—when new personal communications services licenses allocated 120 MHz of bandwidth in 1995–1996.

Table VI-F shows the capital spending history of the wireless sector.

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facility and the right to charge additional fees or increase borrowing costs. These changes can reduce a company's ability to fund operations and growth.

251 In addition to the decrease in license costs discussed here, we would expect a reduction in operating costs. One way that wireless companies accommodate increased numbers of customers when constrained by spectrum availability is to increase the number of towers in a given area. Doing so effectively divides the area into smaller cells, which effectively allows the firms to isolate customers' calls. Firms do this, however, at the cost of increased switching—transferring a mobile customer's call from cell to cell as he changes location. Increased bandwidth would allow the company to manage the same volume of calls with fewer towers and reduced switching-related expenditures.

252 Thomas W. Hazlett, *Exit Strategies for the Digital TV Transition*, U.S. Senate Commerce Committee (June 9, 2004).

Table VI-F. Wireless Sector Capital Spending: 1988–2003

Year	Revenues	Capital Spending	% Change	Cumulative Capital Spending	% Change	Capital Expenditures / Revenues (%)
1988	$1,959	$1,039	–	$3,274	–	53.0
1989	$3,340	$1,206	16.0	$4,480	36.8	36.1
1990	$4,548	$1,801	49.4	$6,281	40.2	39.6
1991	$5,708	$2,389	32.7	$8,671	38.0	41.9
1992	$7,822	$2,590	8.4	$11,262	29.9	33.1
1993	$10,892	$2,694	4.0	$13,956	23.9	24.7
1994	$14,229	$4,982	84.9	$18,938	35.7	35.0
1995	$19,081	$5,141	3.2	$24,080	27.1	26.9
1996	$23,634	$8,493	65.2	$32,573	35.3	35.9
1997	$27,485	$13,484	58.8	$46,057	41.4	49.1
1998	$33,133	$14,484	7.4	$60,542	31.4	43.7
1999	$40,018	$10,722	–26.0	$71,264	17.7	26.8
2000	$52,466	$18,359	71.2	$89,624	25.8	35.0
2001	$65,316	$15,405	–16.1	$105,030	17.2	23.6
2002	$76,508	$21,892	42.1	$126,922	20.8	28.6
2003	$87,624	$18,944	–13.5	$145,866	14.9	21.6

Notes & Sources: Revenues and capital spending are in $ millions. Cumulative capital spending does not equal the sum of capital spending because of rounding. Cellular Telecommunications and Internet Association, *CTIA's Semi-Annual Wireless Industry Survey, June 1985–December 2003* (2004); http://files.ctia.org/pdf/CTIA_Semiannual_Survey_YE2003.pdf.

Cellular phone systems were first licensed in the United States in 1984–1989. Two systems were permitted to operate in each market, and each license was allotted 25 MHz of radio spectrum. This duopoly existed until the mid-1990s. Then, the FCC distributed PCS licenses via auctions beginning in December 1994 and concluding in May 1996. The commission issued six licenses in each U.S. market: three allocated 30 MHz; three allocated 10 MHz. (Licenses could be aggregated, so long as total allocated spectrum did not rise above 45 MHz—a "spectrum cap" the FCC later lifted.)[253]

With PCS entry, the amount of spectrum available to commercial wireless networks approximately *tripled*. The historical bandwidth increase roughly corresponds to our recommendation of adding 200 MHz of additional spectrum today to increase the 189 MHz allocated (including the PCS C block) to 389 MHz—an increase of 106 percent. Although wireless carriers invested capital during the post-PCS licensing period to build out networks and to shift customers from analog to digital systems,[254] we use this period as a rough model for the effects of increasing the availability of frequency. We focus on the changes in wireless investment just as PCS spectrum was being made available to market competitors in 1994–1998.

[253] Note that only 90 MHz of this spectrum have been fully deployed; the remaining 30 MHz have remained embroiled in the legal controversy surrounding NextWave.

[254] It appears clear, however, that the emergence of PCS competition considerably intensified the incentive for analog cellular systems to shift to digital technologies. So capital expenditures for digitization may be importantly, if indirectly, related to spectrum liberalization. It is clear that those expenditures are directly related to deregulation, as the 1988 FCC decision allowing carriers to offer digital services (analog had been mandated when cellular licenses were previously awarded) was a necessary trigger for this technology upgrade.

During the three-year period between the beginning of 1991 and the end of 1993, capital spending of wireless carriers remained steady, averaging $2.6 billion per year.[255] From 1994 through 1996, with the PCS license awards, capital spending rose to $6.2 billion per year. Between 1997 and 1998 wireless carriers were deploying infrastructure to use the increased spectrum capacity, and capital spending doubled again to $13.9 billion per year. Over the 1994–1998 period, capital spending averaged $9.3 billion per year, or $46.6 billion in aggregate. This implies that annual capital expenditures for wireless providers rose about $6.7 billion in the wake of PCS entry.

To project the effects of making an additional 200 MHz of bandwidth available to service providers today, we assume the same increase in capital spending (in absolute dollar terms) that occurred following PCS licensing. As reported in Table VI-G, this results in a capital spending increase of $33.8 billion over the next five years.

TOTAL CAPITAL SPENDING IMPACT

The multiplier effect causes increased capital spending in the telecommunications sector to affect the rest of the U.S. economy.[256] Starting with the basic assumption that the economy has unused resources, such as unemployed workers, economic theory states that increasing purchases in one sector increases incomes for the people who work there, which begins a ripple effect. Higher incomes lead to more spending, and this new spending creates yet more jobs and incomes.

The government measures these multipliers for each sector, so that we can calculate the effect of each dollar of capital spending on the rest of the economy. Bureau of Economic Analysis multipliers suggest that each additional dollar of telecom capital spending leads to $2.86 in extra output, while every $1 million rise in telecommunications capital spending leads to 18.2 additional jobs.[257] As shown in Table VI-G, the increases in telecom capital spending that would result from our proposed reforms would be likely to add $167 billion in cumulative output by 2009 and increase employment by an average of more than 212,000 jobs.

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255 The historical figures in this subsection refer to calculations based on data from the Cellular Telecommunications and Internet Association. See *CTIA's Semi-Annual Wireless Industry Survey (June 1985–December 2003)* (2004); http://files.ctia.org/pdf/CTIA Semiannual_Survey_YE2003.pdf.

256 See, for example, RUDIGER DORNBUSCH AND STANLEY FISCHER, MACROECONOMICS (McGraw Hill, 1994), at 66.

257 Bureau of Economic Analysis, *Regional Input-Output Modeling System (RIMS II)* (2002).

Table VI-G. Impact of Reforms on Capital Spending, GDP, and Employment: 2005–2009

Capital Spending	2005	2006	2007	2008	2009	Total	Average
RBOC TELRIC	$877	$1,974	$4,170	$4,170	$4,170	$15,360	$3,072
CLEC	$540	$540	$540	$540	$540	$2,700	$540
RBOC DSL	$239	$438	$607	$808	$975	$3,067	$613
Cable Modem	$115	$144	$136	$156	$163	$713	$143
Cable Telephony	$527	$527	$527	$527	$527	$2,633	$527
Wireless	$2,424	$2,584	$5,935	$10,926	$11,927	$33,796	$6,759
Total	**$4,721**	**$6,207**	**$11,914**	**$17,126**	**$18,301**	**$58,269**	**$11,654**

GDP	2005	2006	2007	2008	2009	Total	Average
RBOC TELRIC	$2,508	$5,648	$11,927	$11,927	$11,927	$43,937	$8,787
CLEC	$1,545	$1,545	$1,545	$1,545	$1,545	$7,723	$1,545
RBOC DSL	$682	$1,253	$1,737	$2,311	$2,790	$8,773	$1,755
Cable Modem	$329	$411	$388	$447	$466	$2,040	$408
Cable Telephony	$1,506	$1,506	$1,506	$1,506	$1,506	$7,531	$1,506
Wireless	$6,934	$7,392	$16,977	$31,254	$34,117	$96,673	$19,335
Total	**$13,504**	**$17,754**	**$34,079**	**$48,990**	**$52,350**	**$166,677**	**$33,335**

Employment	2005	2006	2007	2008	2009	Total	Average
RBOC TELRIC	15,972	35,964	75,946	75,946	75,946	N/A	55,955
CLEC	9,836	9,836	9,836	9,836	9,836	N/A	9,836
RBOC DSL	4,344	7,982	11,058	14,718	17,764	N/A	11,173
Cable Modem	2,095	2,616	2,469	2,844	2,964	N/A	2,598
Cable Telephony	9,590	9,590	9,590	9,590	9,590	N/A	9,590
Wireless	44,152	47,067	108,104	199,014	217,247	N/A	123,117
Total	**85,990**	**113,055**	**217,003**	**311,949**	**333,348**	**N/A**	**212,269**

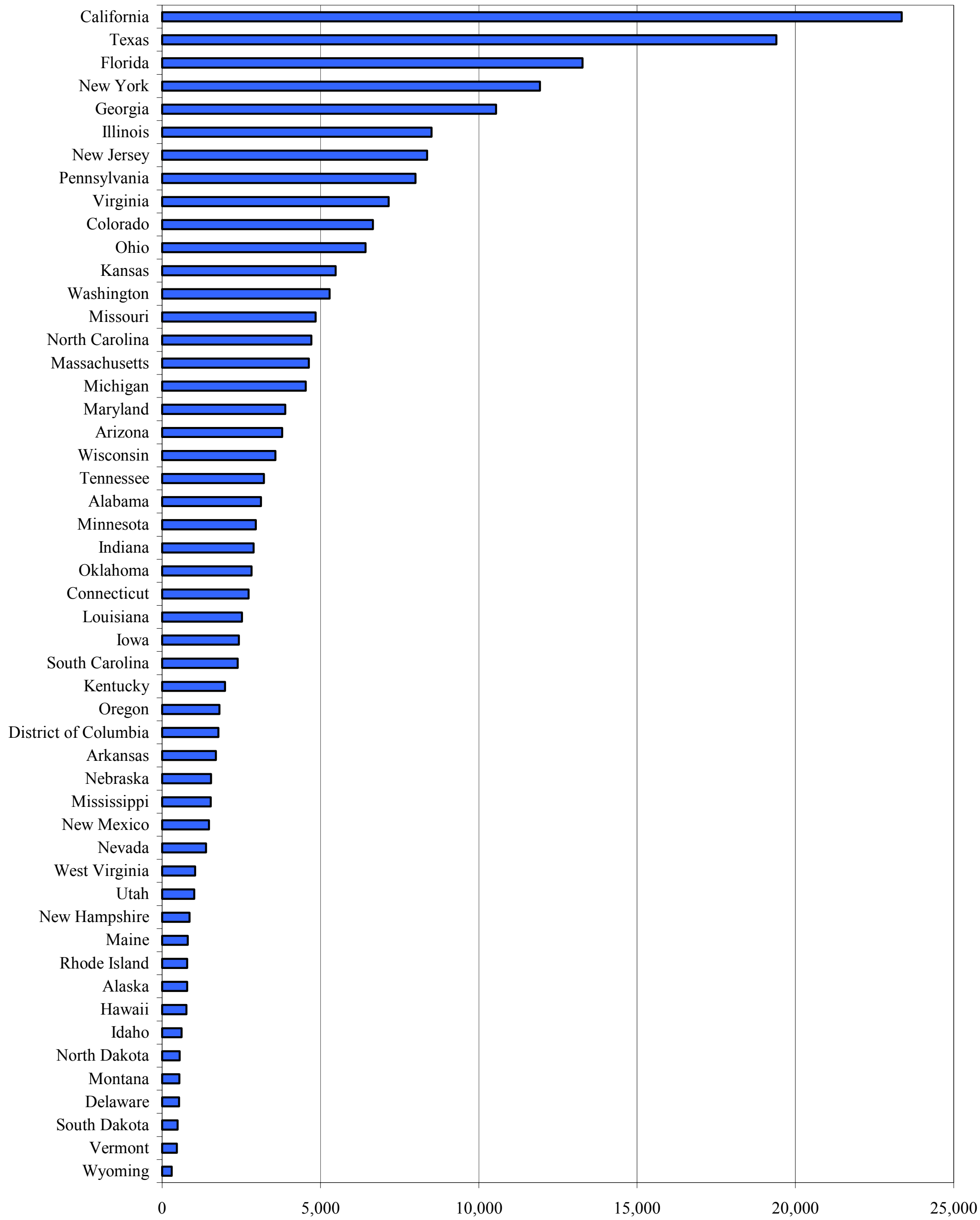
Notes & Source: Capital spending and GDP impacts are in $ millions. Totals may not match the sum of each category because of rounding. Rutledge Capital calculations (May 2004).

REGIONAL EMPLOYMENT IMPACT OF PROPOSED REFORMS

The employment increases in the above analysis will be distributed across different state economies in rough proportion to the relative importance of telecommunications and telecommunications equipment employment in each state, as shown in the following estimates based on state employment data from the Bureau of Labor Statistics. See Figure VI-B and Table VI-H.[258]

[258] Rutledge Capital calculations (May 2004). We have calculated the estimates in Figure VI-A for each state by multiplying the total increase in employment in Figure VI-H times the percentage of total telecommunications employment to total employment for that state. Data are from Bureau of Labor Statistics, year-end 2003; http://www.bis.gov/labjava/ outside.jsp?survey=sm.

Figure VI-B. Average Additional Employment from Deregulation by State: 2005–2009



Source: Rutledge Capital calculations (May 2004). Data are from Bureau of Labor Statistics, year-end 2003; http://www.bls.gov/labjava/outside.jsp?survey=sm.

Table VI-H. Average Additional Employment Impact by State Due to Reforms: 2005–2009

State	Telecom Jobs	State Percentage of Total U.S. Telecom Employment	Rutledge Estimates of Additional Jobs
Wyoming	1,570	0.14%	302
Vermont	2,429	0.22%	467
South Dakota	2,541	0.23%	489
Delaware	2,766	0.25%	532
Montana	2,840	0.26%	547
North Dakota	2,878	0.26%	554
Idaho	3,200	0.29%	616
Hawaii	4,000	0.36%	770
Alaska	4,100	0.37%	789
Rhode Island	4,111	0.37%	791
Maine	4,186	0.38%	805
New Hampshire	4,485	0.41%	863
Utah	5,300	0.48%	1,020
West Virginia	5,400	0.49%	1,039
Nevada	7,200	0.65%	1,385
New Mexico	7,700	0.70%	1,482
Mississippi	8,000	0.73%	1,539
Nebraska	8,035	0.73%	1,546
Arkansas	8,800	0.80%	1,693
District of Columbia	9,231	0.84%	1,776
Oregon	9,400	0.85%	1,809
Kentucky	10,300	0.93%	1,982
South Carolina	12,400	1.12%	2,386
Iowa	12,595	1.14%	2,424
Louisiana	13,100	1.19%	2,521
Connecticut	14,200	1.29%	2,732
Oklahoma	14,700	1.33%	2,829
Indiana	15,000	1.36%	2,886
Minnesota	15,400	1.40%	2,963
Alabama	16,200	1.47%	3,117
Tennessee	16,700	1.51%	3,213
Wisconsin	18,575	1.68%	3,574
Arizona	19,700	1.79%	3,791
Maryland	20,200	1.83%	3,887
Michigan	23,600	2.14%	4,541
Massachusetts	24,100	2.18%	4,637
North Carolina	24,500	2.22%	4,714
Missouri	25,200	2.28%	4,849
Washington	27,500	2.49%	5,292
Kansas	28,500	2.58%	5,484
Ohio	33,400	3.03%	6,427
Colorado	34,600	3.14%	6,658
Virginia	37,200	3.37%	7,158
Pennsylvania	41,600	3.77%	8,005
New Jersey	43,500	3.94%	8,370
Illinois	44,200	4.01%	8,505
Georgia	54,800	4.97%	10,545
New York	62,000	5.62%	11,930
Florida	69,000	6.25%	13,277
Texas	100,800	9.14%	19,396
California	121,400	11.00%	23,360
Total			**212,269**

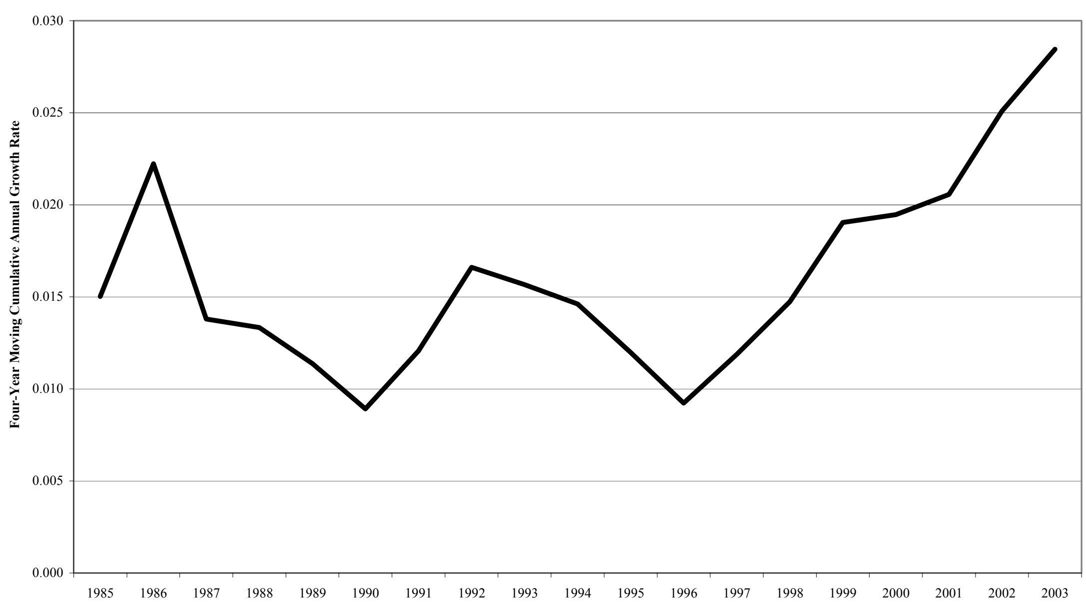
Note & Sources: The sum of Rutledge estimates of additional jobs does not equal total estimated additional jobs because of rounding. Rutledge Capital calculations (May 2004). Data are from Bureau of Labor Statistics, year-end 2003; http://www.bls.gov/labjava/ outside.jsp?survey=sm.

THE PRODUCTIVITY CHANNEL

The most powerful and lasting impact of the proposed telecommunications reforms will occur indirectly through the impact of increased telecommunications investment on the productivity and competitiveness of American companies and American workers. Reforming regulations to encourage investment in new high-speed networks will both reduce costs and improve service quality for U.S.-based companies employing U.S. workers and will thus make them more effective competitors in international markets.

The period since 1995 has shown a remarkable increase in U.S. productivity growth. After increasing at just increased 1.4 percent per year between 1980 and 1995, labor productivity accelerated to 3.0 percent per year between 1995 and 2003, as shown in Figure VI-C.[259]

Figure VI-C. Productivity Growth (Output per Hour: Nonfarm Business): 1985–2003



Source: Employment, hours, and earnings are from Bureau of Labor Statistics, *Current Employment Statistics Survey (national)* (2004); http://data.bls.gov/labjava/outside.jsp?survey=ce.

A consensus has emerged among researchers that telecommunications and other information technology investments have been the principal drivers behind the extraordinary doubling of productivity growth of U.S. workers that has taken place since

259 Bureau of Labor Statistics, Major Sector Productivity and Costs Index (national) (2004); http://data.bls.gov/servlet/SurveyOutputServlet?jrunsessionid=109054755847953820.

1995[260] and that investments in information and communications technology (ICT) may account for as much as three-fourths of overall labor productivity growth since 1995.[261]

In a recent study, economists R. W. Ferguson, Jr., and W. L. Wascher examined four episodes of high productivity growth.[262] As Table VI-I shows, output per hour of work increased faster in 1995–2003 than in all but the 1917–1927 episode, which was fueled by the return of military personnel after World War I.[263] The recent period of high productivity growth was characterized by unprecedented contributions from capital deepening (more capital per worker) and from labor composition (improved education, training, and skills per worker), as well as by a 1.0 percent per year of multifactor productivity growth, a term economists use to represent increases in output per unit of combined labor and capital inputs.

Multifactor productivity growth is often referred to as technological change. After examining each of the episodes of high productivity growth, Ferguson and Wascher conclude, "Although the productivity booms of the past century and a quarter obviously differed in many respects, each episode can readily be associated with the introduction of one or more prominent new technologies."[264] And, in trying to understand the 1995–2003 growth episode specifically, they write:

> [T]he real drivers of the productivity gains in the 1990s were the related high-tech innovations of the 1970s and 1980s, including the personal computer, fiber optics, wireless communications, and the Internet. Many of the recent technological innovations have significantly altered the ways in which firms interact with their customers and have raised the productivity of the economy as a result.[265]

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260 Dale W. Jorgenson, M. S. Ho, et al., *Lessons for Europe from the U.S. Growth Resurgence*, 25 J. POL'Y MODELING 453–70 (2003).

261 S. Oliner and D. E. Sichel, *Information Technology and Productivity: Where Are We Now and Where Are We Going?* 25 J. POL'Y MODELING 477 (2003).

262 R. W. Ferguson, Jr., and W. L. Wascher, *Distinguished Lecture on Economics in Government: Lessons from Past Productivity Booms*, 18 J. ECON. PERSP. 6 (2004).

263 Notes on data sources in Table VI-I are from *id.* at 6. Labor productivity is measured as output per hour worked in the nonfarm business sector. Multifactor productivity is defined as output per unit of combined labor and capital inputs. The contribution of capital deepening to labor productivity growth is the change in capital services per hour weighted by capital's share of nominal output, and the contribution from labor composition is the change in the average quality of the work force (by education and experience); separate estimates for capital deepening and labor composition are available only beginning in 1948. Data from 1873 to 1948 are from JOHN W. KENDRICK, PRODUCTIVITY TRENDS IN THE UNITED STATES (Princeton Univ. Press, 1961). For the periods after 1948, data are from the Bureau of Labor Statistics. Labor productivity data from the BLS are available through 2003, whereas data on multifactor productivity, capital services, and labor composition are published only through 2001.

264 R. W. Ferguson, Jr., and W. L. Wascher, *Distinguished Lecture on Economics in Government: Lessons from Past Productivity Booms*, 18 J. ECON. PERSP. 7 (2004).

265 *Id.*

Further, they point out that past episodes of high productivity growth were typically fueled by the dispersion of "general purpose technologies," with wide applicability, such as advances in communications.

Table VI-I. U.S. Productivity Growth
(Average Annual % Change, Nonfarm Business Sector): 1873–2003

Period	Labor Productivity	Multifactor Productivity	Contribution of Capital Deepening and Labor Composition
1873–2003	2.2	1.3	0.9
Episode I			
1873–1890	2.6	1.5	1.1
1890–1917	1.5	0.8	0.7
Episode II			
1917–1927	3.8	2.8	1
1927–1948	1.8	1.7	0.1
Episode III			
1948–1973	2.9	1.9	1
1973–1995	1.4	0.4	1
Episode IV			
1995–2003	3	1	1.6

Source: R. W. Ferguson, Jr., and W. L. Wascher, *Distinguished Lecture on Economic Government: Lessons from Past Productivity Booms*, 18 J. ECON. PERSP. 6 (2004).

The opportunity presented today stems from the fact that the 1995–2003 productivity boom has been primarily restricted to large companies and urban areas wired with high-speed telecommunications networks. The $58 billion increase in capital spending that is projected to take place with our proposed regulatory reforms could bring the advantages of high-speed telecommunications networks to the small companies and small towns that produce more than half of GDP and account for three of every four new jobs.[266] These investments could lead to a second wave of productivity growth of as much as 0.25 percent per year. As shown in Table VI-J, a quarter-point productivity growth increase would add $93 billion per year to GDP, which amounts to $467 billion in additional goods and services over the next five years.

[266] Office of Advocacy, U.S. Small Business Association, *Small Business Economic Indicators* (2003); http://www.sba.gov/advo/stats/sbei02.pdf.

Table VI-J. Productivity Impact of Reform: 2005–2009

	2005	2006	2007	2008	2009	Total	Average
GDP without Reforms	$11,827	$12,182	$12,548	$12,924	$13,312		
GDP Growth, No Reforms	3.5%	3.0%	3.0%	3.0%	3.0%		
Productivity Impact of Reforms	0.25%	0.25%	0.25%	0.25%	0.25%		
GDP Growth with Reforms	3.8%	3.3%	3.3%	3.3%	3.3%		
GDP with Reforms	$11,856	$12,241	$12,639	$13,050	$13,474		
Additional GDP	$29	$59	$91	$126	$162	**$467**	**$93**
Additional GDP as % of GDP	0.2%	0.5%	0.7%	1.0%	1.2%		
Cumulative GDP Impact	$29	$88	$179	$305	$467		
Cumulative GDP Impact as % of GDP	0.2%	0.7%	1.4%	2.4%	3.5%		
Median Family Income, No Reforms	$57,353	$59,073	$60,846	$62,671	$64,551		
Median Family Income with Reforms	$57,491	$59,360	$61,289	$63,281	$65,338		
Additional Annual Income	$139	$286	$443	$610	$786	**$2,265**	**$453**
Cumulative Income Impact	$139	$425	$868	$1,478	$2,265		

Notes & Source: GDP is in $ billions. Discrepancies in additional and cumulative impacts are due to rounding. Rutledge Capital calculations (May 2004).

TOTAL IMPACT OF REFORMS

The total impact of the telecommunications reforms recommended in this report is the sum of the demand effect of increased capital spending on network assets plus the supply effect of increased productivity growth. Table VI-K displays estimates of the total impact of reforms on GDP and employment over the next five years.

Table VI-K. Total Impact Estimates: 2005–2009

Total Impact	GDP	Employment
RBOC TELRIC	$43,937	55,955
CLEC	$7,723	9,836
RBOC DSL	$8,773	11,173
Cable Modem	$2,040	2,598
Cable Telephony	$7,531	9,590
Wireless	$96,673	123,117
Total Capital Expenditures Impact	**$166,677**	**212,269**
Productivity Impact	**$467,036**	**0**
Total Economic Impact	**$633,713**	**212,269**

Note & Source: GDP is in $ billions. Rutledge Capital calculations (May 2004).

In aggregate, our estimates suggest that telecommunications reform has the potential to increase average annual GDP by about $126 billion per year over the next five years, which will add an estimated $634 billion in goods and services. Employment will increase by an average of more than 212,000 jobs over the next five years. On the basis of recent estimates of the Congressional Budget Office, federal tax revenues will average 17.8 percent of GDP in 2005–2009.[267] If this relationship applies to incremental

[267] Congressional Budget Office, THE BUDGET AND ECONOMIC OUTLOOK: FISCAL YEARS 2005 TO 2014 (2004), at xiii.

GDP as well, our reforms would generate an additional $113 billion in federal tax revenues over five years.

SUMMARY

We have described the state of the telecommunications industry and the current regulatory environment. We have outlined a set of regulatory reforms that would invigorate the sector and deliver large benefits to consumers, workers, and businesses throughout the U.S. economy, and we have created rough empirical estimates of the magnitude of the benefits that would follow such deregulatory reforms. See Table VI-L.

Table VI-L. Point Estimates of Economic Impacts from Proposed Regulatory Reforms

1. $58 billion in new capital investment over five years.
2. Investment-led increases in economic growth that result in GDP increases of $167 billion over five years.
3. Increased productivity, adding an additional $467 billion to GDP.
4. A combined effect of both supply and demand channels totaling $634 billion of additional goods and services, including $113 billion in new tax revenues over five years.
5. An increase in average employment levels by more than 212,000.
6. Added consumer value from price competition and innovative new services.
7. Enhanced U.S. competitiveness in the global marketplace.
8. Accelerated rollout of new technologies and advanced networks in knowledge-based industries and applications.
9. Achievement of social goals such as universal service.

No change is easy to make. It will take forceful action by policymakers to effect these reforms. Each year of delay will cost the U.S. economy about $12 billion of investment spending and about $33 billion of GDP and will deter the creation of more than 212,000 jobs.

VII
EPILOGUE

This report has investigated the regulatory morass that now dominates the telecommunications sector. Despite the failure of some competitive policies, the opportunity for marketplace rivalry in last-mile telecom service has never been brighter. The emergence of cable telephony, multiple national wireless carriers, and alternative broadband platforms means that the structure of a workably competitive market is already in place. With deregulatory policies that move aggressively to unleash the myriad opportunities for rival networks—including spectrum liberalization and clear, low-barrier rules for VoIP entrants—next-generation technologies will soon render legacy systems obsolete.[268] *Ironically, regulatory capital has been invested in ill-advised efforts to salvage and apportion the remnants of yesterday's marketplace, and this effort has undercut the efforts to build tomorrow's competitive arena.*

*

We have written this study as actual regulatory events have been buffeting telecommunications markets. Federal rules governing network-sharing obligations for incumbent phone carriers, after a last-minute flurry of legal skirmishing,[269] lapsed on June 15, 2004, pursuant to the decision of the U.S. Court of Appeals for the D.C. Circuit in March 2004. This policy switch has rocked the sector. The entire regime governing competitors' use of "unbundled elements" provided by legacy phone networks has officially ended. While interim measures will extend existing agreements for some months,[270] a new regulatory structure is coming, and it may better encourage "facilities-based competition"—entrants building new networks.

268 "The Bells have largely won 'yesterday's' narrowband battle with T, MCIP and the CLECs, but we believe they are highly likely to lose the 'future' and larger competitive broadband and access wars with VoIP, cable, wireless, substitution, wireless broadband, and Broadband over Power lines (BPL)." Scott Cleland, *Muddier Bell Outlook: Deregulatory Pendulum Swing Has Peaked, and Present vs. Future Dichotomy*, PRECURSOR TELECOM & MEDIA RES. (Sept. 3, 2004).

269 The key issues involved whether the Bush Administration would appeal the March 2004 ruling by the U.S. Court of Appeals for the D.C. Circuit overturning UNE rules; on June 9, 2004, the administration announced that it would not. The U.S. Supreme Court was then petitioned to block the appellate ruling from taking effect. On June 14, the Court ruled that it would not do so. Stephen Labaton, *Administration Sides with Bells on Lease Discounts for Rivals*, N.Y. TIMES (June 9, 2004); Ben Charny, *Chief Justice Rejects Telecom Case*, CNET NEWS.COM (June 14, 2004); http://marketwatch-cnet.com.com/2102-1037_3-5233301.html?tag=st.util.print.

270 "[A]s a practical matter the current economic arrangements between the Bells and IXCs/CLECs will largely stay in place through the end of the year." Legg Mason, *Another FCC Rulemaking on Horizon (Oh Joy); IXC Decisions, Election, May Mitigate Impact*, TELECOM & MEDIA INSIDER (June 14, 2004), at 2.

Responses by leading telecommunications service providers to the collapse of UNE rules offer important information. Some firms relying on UNE-P resale announced sharp cutbacks in their retailing efforts; a notable example was AT&T's new policy to withdraw from some consumer telephone markets (both local and long-distance).[271] In some cases, wholesale agreements were struck between incumbent phone networks and CLECs, including a deal where MCI contracted to use the network facilities of Qwest.[272] Verizon announced agreements with CLECs Sterling Telecom and Granite Telecom;[273] and SBC formed a relationship with Sage.[274]

But as CLECs abandoned UNE-P, they simultaneously embraced emerging networks. AT&T, the largest CLEC, teamed with McLeodUSA, a smaller one, to shift some of AT&T's over 4 million local customers to McLeod's network, which leases just the local loop from incumbent phone systems (UNE-L).[275] AT&T claims that the venture is "a major step moving away from dependence on the Bells' UNE-P to facilities-based competition."[276] To make the transition practical, both firms argue that regulatory certainty is needed—excellent advice in virtually any context.

In another revealing development, Covad, a data services provider that rents incumbents' local loops to deliver DSL service, has joined the Intel-led WiMAX Coalition developing wireless broadband networks. "WiMAX lets providers bypass phone companies for the 'last mile' connections to homes and businesses."[277] The move to wireless is reported to be a function of just the economic incentives that counterproductive regulations have undermined:

> Covad has relied on traditional copper lines leased from the Bells for its DSL service, using access that has been mandated for years…. But the Federal Communications Commission is phasing in regulations that will not require the Bells to share new lines with outside companies. Fearing that the Bells will charge exorbitant rates or refuse to share lines altogether, Covad and other companies that resell Internet access are looking for alternative technologies for their wholesale broadband. EarthLink has already made initial forays into the wireless market, recently launching a service with Digitalpath in Northern California.[278]

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271 AT&T, News Release, *AT&T Announces Second-Quarter 2004 Earning, Company to Stop Investing in Traditional Consumer Services; Concentrate Efforts on Business Markets* (July 22, 2004); http://att.com/news/item/0,1847,13163,00.html.

272 MCI, News Release, *MCI and Qwest Reach Commercial Agreement for Wholesale Services* (May 31, 2004); http://global.mci.com/news/news2.xml?newsid=10710&mode=long&lang=en&width=530&root=/&langlinks=off.

273 *Verizon Entering into Commercial Agreement with a Wholesale Customer*, PR NEWSWIRE (June 18, 2004); *Granite Telecom Moves Quickly for Verizon Rate Deal*, BOSTON BUS. J. (June 16, 2004).

274 SBC, Press Release, *SBC, Sage Telecom Reach Wholesale Telecom Service Agreement* (Apr. 3, 2004).

275 Susan Polyakova, *AT&T to Move to UNE-L If Regulatory Clarity Is Ensured*, COMMUN. DAILY (July 8, 2004).

276 *Id.*

277 Bill Wolfe, *New Long-Range Standard May Heat Up Wireless Internet*, COURIER-J. (Feb. 22, 2004).

278 Jim Hu, *Cable, DSL Face Threats,* CNET NEWS.COM (July 29, 2004); http://news.com.com/pdf/ne/2004/Digital_Agenda_Broadband.pdf.

The informed consensus is that, despite the decline of resellers, "wireless and VoIP (Voice over Internet Protocol) services, including over cable, will likely provide increasing competition."[279] These alterative technologies are advancing daily. Sprint recently entered agreements with Time Warner Cable and Mediacom to offer VoIP over cable infrastructure.[280] AT&T has been active, announcing that it will offer Internet telephone service (VoIP) in the top 100 U.S. markets by September 30, 2004. As of July 1, 2004, the company announced that it had already begun service in seventy-two of these markets, spread across twenty-two states. An official statement by the company noted that although VoIP was "an exciting technology with great promise, it is not a complete substitute for traditional telephone service" because less than one-third of U.S. households have high-speed connections. But the company optimistically notes: "VoIP application might just be the 'value-add' that consumers are seeking to justify their investment in broadband."[281] That strategy is the motivation for AT&T's recently announced collaboration with Adelphia, the nation's fifth largest cable operator, to market VoIP over cable modems.[282]

This is a subtle but powerful truth. Regulators have offered new phone competitors discounts to use existing infrastructure, and retail price competition has developed. But those discounts are due to the cost-accounting model bureaucrats have chosen, not to market efficiencies. More ominously, exciting new technologies have been undercut. To the degree that policies have lowered prices for plain old telephone service, they have stunted the growth of far more powerful networks that deliver voice, video, and high-speed data. Taking away the artificial prop beneath one form of competition can now unleash far more productive market forces.

As VoIP service is added to high-speed Internet access, tens of millions of U.S. homes will subscribe if policymakers resist the temptation to distort price signals. Few things are more expensive than a service made cheap by government subsidies or industrial policy. In local telecommunications service, we see both.

Fortuitous events now yield the opportunity to escape a regime that discourages network growth. We have outlined a broad series of reforms to make this happen by focusing on rules that allow new technologies and market-based competition to eclipse administrative combat over the "forced marriages" of network-sharing mandates. These skirmishes are socially unproductive and ought to be rendered obsolete. With recent legal and regulatory developments shifting in this direction, the possibility of proconsumer reform looms.

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279 Legg Mason, Memorandum, *Bells on Roll, but FCC Fights Affect Speed, Scope of Wholesale/UNE Relief* (June 30, 2004), at 1.

280 Laura Warner, Carrie Hart, and Brian Kraft, *MCCC Announces VOIP Agreement with Sprint*, CREDIT SUISSE FIRST BOSTON EQUITY RESEARCH (Aug. 24, 2004).

281 Wireline Section, COMMUN. DAILY (July 1, 2004).

282 "AT&T also will be able to facilitate new cable modem service orders when customers call to inquire about CallVantage." Karen Brown, *Adelphia Taps AT&T for VoIP Service*, CED BROADBAND DIRECT NEWS (Sept. 1, 2004); http://www.cedmagazine.com/cedailydirect/2004/0904/cedaily040901.htm.

Revealingly, the lapse of unbundling obligations did not stimulate instant investor enthusiasm for Bell company shares, which hardly budged.[283] This was no surprise to analysts who have largely touted the theme: "Bell Legal Victory: Winning the Battle, but Losing the War."[284] A sober assessment of the marketplace leads to the conclusion that the incumbents' legacy networks are better off with fewer unbundling obligations, but that overall the regulatory relief is "too little, too late, and technology has replaced regulation as the main driver of the competitive threat to the Bells."[285] Incumbent networks will fade into history unless they can convince capital markets to parlay their existing assets into advanced information systems. That immerses the Bells in hostile competitive waters, where they are confronted by new risks.

The most vital of these will be posed by the "category killers," infrastructures that disrupt seemingly tranquil markets by bursting in from somewhere else. Millions of U.S. wireless households have dropped their fixed-line phones altogether, and millions more buy service from an adjacent wire owned by the cable company. With VoIP riding so cleanly on the cable modem or DSL connection, millions more will soon follow.

Head-to-head competition is vital, but it often makes a diagonal entrance. The success of satellite TV triggered a chain reaction that has invigorated the broadband race between cable modems and DSL. And today's satellite-phone alliances are responding to the cable operators' "triple threat." Now, a price war is at hand, with Cablevision, a large New York–based cable operator, offering over 140 video and audio channels, high-speed Internet access, and local and long-distance calling for $90 a month.[286]

Additional wireless networks—fixed, mobile, and satellite—would be empowered were government regulators to allocate the necessary bandwidth to licensees. VoIP applications would extend further, and at lower prices, if government were to craft simple policies with minimal regulation to induce needed investment. But instead of acting decisively, a recent FCC VoIP proposal "is so vague it is impossible to provide a regulatory analysis of its impact, according to the U.S. Small Business Administration."[287] The authors of this study hope that the reforms offered herein

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283 Between June 9, 2004 (when the Bush Administration announced that it would not appeal the opinion of the U.S. Court of Appeals for the D.C. District to the U.S. Supreme Court) and June 15, 2004 (when the UNE rules were allowed to lapse after the U.S. Supreme Court turned down a stay the preceding day), the legal battle to save the existing UNE rules was lost. Share prices of the three highly capitalized Bell operating companies (BellSouth, SBC, and Verizon) from market opening on June 1 to close on June 21, a period framing the regulatory period, reveal virtually no movement relative to the S&P 500 Index. (Equally weighted returns, relative to the market, are 0.13 percent for the three companies over the three-week period.)

284 Scott Cleland, *Bell Legal Victory: Winning the Battle, But Losing the War*, PRECURSOR TELECOM & MEDIA RES. (June 18, 2004).

285 *Id.*

286 *CableVision Rolls Out Internet/Cable/Phone Package*, CONSUMERAFFAIRS.COM (June 21, 2004); http://www.consumeraffairs.com/news04/cablevision_bundle.html; Cablevision Web site (Aug. 2, 2004); http://www.optimum.com/index.jhtml?pageType=ooo_landing. Approximately 45 of these over 140 channels are audio.

287 Michael Feazel, Brigitte Greenberg, and Dinesh Kumar, *SBA Says FCC May Have to Launch Supplemental VoIP Rulemaking,* COMMUN. DAILY (June 2, 2004).

encourage policymakers to end the conflicting signals and instead spur policies that unambiguously embrace economic incentives to create and enhance the advanced telecommunications networks that American consumers and businesses demand.

APPENDIX I
LIST OF CONTACTS

We would like to thank the following individuals we spoke with in researching this report:

Terry Barnich, president, New Paradigm Resources Group

Timm Bechtler, vice president, Broadband and Wireless Equipment, Legg Mason Wood Walker, Inc.

Robert Calaff, director, Federal Policy, T-Mobile

Dallas Clement, senior vice president, Strategy and Development, Cox Communications

Michele Farquar, partner, Hogan and Hartson

Robert Gensler, manager, T. Rowe Price Global Technology Fund

Kathleen Hamm, managing director, Federal Regulatory Affairs, T-Mobile

Louis Holder, executive vice president, Product Development, Vonage

Robert Pepper, chief, Office of Strategic Planning and Policy Analysis, Federal Communications Commission

Mark Rubin, director, Federal Government Affairs, Western Wireless

Thomas Segrue, vice president, Government Affairs, T-Mobile

David Sieradzki, partner, Hogan and Hartson

Ed Thomas, chief, Office of Engineering and Technology, Federal Communications Commission

Lara Warner, Credit Suisse First Boston

APPENDIX II
SELECTED ANALYST QUOTATIONS

Dennis Saputo et al., *The Far-Reaching Impact of UNE-P Regulation*, MOODY'S INVESTORS SERV. (Oct. 2003), at 1:

"Moody's believes that the FCC's recently released network unbundling order will have a negative credit impact on the industry's wireline operators. Retail line losses derived from Unbundled Network Element Platforms (UNE-P), have become a critical problem for some incumbent local exchange carriers (ILECs).... Moody's believes they will seek to counter the resulting revenue and cash flow loss with expanded service package offerings, which will likely require modest capital investment, aggressive marketing campaigns and discounted pricing to win and retain customer loyalty."

Scott Cleland et al., *FCC Decision Accelerates Disinvestment and Shifts Equipment Demand*, Precusor Group (Mar. 4, 2003) (emphasis omitted):

"The FCC decision unleashes two countervailing forces affecting telecom equipment going forward. The first force is the acceleration of telecom disinvestment through the profit-killing invigoration and extension of UNE-P resale competition. More UNE-P increasingly will pressure equipment spending because capex remains the least painful way to cut costs and protect profits short-term. [Lucent] and [Nortel] have the largest amount of revenue at risk to further Bell capex cuts. The second force is the new and very heavy regulatory bias favoring fiber/packet technology over copper/circuit technology. [Corning] and [Cisco] are the FCC's new 'chosen ones.'"

Telecommunications Industry Association Letter to the Honorable Michael K. Powell, CC Docket No. 01-338 (Nov. 25, 2002), at 2:

"Capital spending in the wireline segment of the industry meanwhile has been falling steadily over the past few years. CSFB reports that wireline carriers spent $113 billion in 2000, $93 billion in 2001 and will spend only an estimated $49 billion in 2002. Deutsche Bank analysts have reduced their view of 2003 capital spending by the telephone carriers to a 15 percent year-over-year decline, instead of an expected decrease of 5 percent to 10 percent. The Precursor Group estimates that the capex reductions could be as high as 30 percent for 2003 compared with 2002 figures."

Dennis Saputo et al., *The Far-Reaching Impact of UNE-P Regulation*, MOODY'S INVESTORS SERV. (Oct. 2003), at 1:

"We conclude that the [Triennial Review Order] has created more downside risk to RBOC ratings than it has upside potential for the CLECs."

Scott Cleland, *Precursor Returning to Negative Telecom Outlook As FCC Invigorates UNE-P*, Precursor Group (Feb. 24, 2003) (emphasis omitted):

"More capex cuts. Other than large job cuts, additional capex cuts are the only major cost cutting options available to large telecoms."

Fulcrum Global Partners, *Wireline Communications: Thoughts on FCC Order* (Feb. 25, 2003):

"We believe the local telephone companies (the RBOCs) will continue to cut capital expenditure budgets in the coming year in an attempt to preserve long-term financial flexibility."

Scott Cleland, *Investor Preview of FCC's Triennial Review Decision*, Precursor Group (Jan. 27, 2003):

"UNE-P has a disproportionate effect on the sector's capex because the local telcos comprise over two-thirds of potential U.S. demand. Since the Bells have exceptionally high fixed-cost business models, slashing variable capex is the only way, other than mass layoffs, to cope with UNE-P arbitrage. Precursor expects cauterizing the UNE-P revenue hemorrhage will stabilize capex in the short-term and enable it to grow later in 2003 and into 2004 as the Bells invest to reduce their network costs."

Kevin Fitchard, *Verizon Pledges Massive DSL Investment*, WIRELESS REV. (Mar. 19, 2003); http://wirelessreview.com/ar/telecom_verizon_pledges_massive/:

"On the heels of the FCC's triennial review of unbundled network elements (UNEs), Verizon today announced a major broadband initiative designed to make 10 million more access lines DSL-capable by the end of the year and to deploy fiber to the home starting in 2004. The RBOC will deploy DSL equipment in an estimated 3500 to 4000 fiber-connected remote terminals and an additional 1000 central offices. The overall outlay is expected to make DSL available to 46 million, or 80%, of Verizon's lines.… Vice Chairman Lawrence Babbio said Verizon would be shifting funds in its estimated $12 to $13 billion capital expense (capex) budget to focus on broadband. Babbio said the initiative was fueled by last month's FCC ruling granting the ILECs broadband relief and by advances in DSL and hybrid fiber technologies allowing Verizon to extend the reach of its access networks."

Frost & Sullivan, *U.S. Wholesale UNE-P Market Insight* **(**2003), at 1-24:

"For now, we would expect that competitive carriers will continue to utilize UNE-P for the key reason that it is still the easiest way for competitive carriers to get into the local markets without making large capital investments."

Report: CLECs Remain Comfortable Riding the UNE-P Train, 23 FIBER OPTICS NEWS (June 23, 2003):

"Are 'artificially low' UNE-P rates contributing to the lack of investment in new network infrastructure? According to research performed by economist Stephen Pociask, president of IT-centric TeleNomic Research, the answer is a resounding 'yes.' Pociask's just-released findings … say in part that the availability of UNE-Ps means CLECs have no incentive to transition from leasing ILEC networks to building their own, because leasing remains cheaper than building. … 'If low UNE and UNE-P prices were intended to save consumers money, they have been a dismal failure,' he says. 'Because UNE-P regulations are usurping market forces and harming facility-based competitive and incumbent carriers, these regulations have created more harm than good for consumers.' This paper finds the annual economic costs of UNE-P regulations to be approximately $101 per household. Said differently, real household income would have been $101 higher, if telecommunications investment had not been stifled by UNE regulations. In contrast, the annual benefits of competition have been estimated to be $1.2 billion—$11.41 per household—basically from lower local telephone prices."

Legg Mason, *FCC Extends Uncertainty; Stocks Appear Near Valuation Floor* (Feb. 21, 2003):

"In our view, the FCC's decision yesterday on the Triennial Review hurts the majority of the telecommunications industry by extending the uncertainty related to key investment issues."

J. Halpern et al., *RBOCs: Upgrading BellSouth on Valuation; FCC's Rulemaking a Mixed Bag—Group Valuations and Yields Compelling But with Few Catalysts*, BERNSTEIN RESEARCH CALL (Feb. 21, 2003):

"Overall the FCC's 'action' was a setback for the RBOCs relative to investor expectations and in its not answering key questions, is driving general uncertainty. As a result we anticipate continued volatility in the trading of all major players though see the market's reaction as overdone and a return to the negativity plaguing sentiment at the end of the summer of 2002 (when uncertainty was far greater and the valuations only slightly lower)."

Frost & Sullivan, *U.S. Wholesale UNE-P Market Insight* (2003), at 1-17:

"As in many industries, uncertainty about future events tends to result in a reluctance to make significant investments into capital and labor. With this decision to not force unbundling of packet switching elements, incumbent carriers have greater certainty as to where there [*sic*] market is heading. This should lead to greater investments in broadband equipment and marketing efforts for broadband services and should lead to greater certainty of what needs to be done to succeed in that market."

Regulatory Uncertainty Could Squeeze $16 Billion from Communications Market, PR NEWSWIRE (June 12, 2003):

"Continued uncertainty resulting from the Federal Communications Commission's 'triennial review' order is sidelining billions of dollars of investment in the communications industry and costing thousands of jobs. … In a study of cable overbuilders, The Eastern Management Group found that companies are having and will continue to have trouble competing with UNE-P competitors that can enter their markets without any capital investment and enjoy instant EBITDA margins of up to 50 percent. … In the 14 markets alone, UNE-P competition is expected to have decreased the size of the overbuilder market by a total of $514 million over three years by the end of 2004. Nationwide, the loss would come to $16 billion over the same period. The Eastern Management Group also conducted a qualitative study of new telecommunications carriers, infrastructure providers and investors to examine the financial impact of the FCC order on individual companies. The result: the uncertainty created by the FCC's decision to transfer regulatory authority to 51 separate jurisdictions will inhibit investment, economic growth and job creation."

States Struggle to Untangle Effects of Court's TRO Ruling, COMMUNICATIONS DAILY (Mar. 4, 2004):

"The practical result of the ruling Tues. by the U.S. Appeals Court, D.C., that vacated much of the FCC's UNE order 'remains very much in doubt,' Legg Mason analysts said in a research report Wed. … Medley Global Advisors concluded that 'the battle over the fate of unbundled switching is far from over and the course the FCC will take going forward is far from certain.' Medley said in a report it expected Congress to weigh in through hearings. 'Regardless of what action the Commission takes, UNE-P will probably not be eliminated from the market any time soon,' the report said. Access to UNEs is written into interconnection contracts 'which are legally binding so regulatory uncertainty for the Bells will probably remain at least until next year,' it said. … 'Neither of our companies stands to benefit from continued uncertainty in the industry,' [SBC Chariman] Whitacre said: 'It is up to all of us to close this long, costly and debilitating chapter in our industry's history.'"

Todd Rosenbluth, *For Whom the Bells Toll; The Baby Bells Have Won a Legal Battle in the Ongoing War over Access Charges, but S&P Doesn't Think Their Problems Will End There*, BUSINESSWEEK ONLINE (Mar. 4, 2004):

"The Baby Bells … which have faced a multitude of operational challenges in the past six months, received some relatively good news on Mar. 2. In the latest development in their long-running tussle with competitors over the access fees charged for traffic on the Bells' local phone network, the District of Columbia Circuit Court ruled to vacate parts of the Federal Communications Commission's rules enabling wholesale access by competitors … to the Bells' network through the unbundled network element platform (UNE-P). The court remanded the issue back to the agency.

… While the ruling appears to be a modest victory for the Baby Bells, we at Standard & Poor's Equity Research Group are keeping our negative outlook on the group, also known as the Regional Bell Operating Companies (RBOCs). We believe that the legal tussle over the wholesale-access issue is far from over. We expect additional appeals and stays in the case."

Scott Cleland, *Bell Legal Victory: Winning the Battle but Losing the War*, Precursor Advisors (June 18, 2004) (emphasis omitted):

"The Bells clearly won an important legal battle, they are still losing the overall competitive war, which is ultimately what matters. … Precursor believes competitive pressure on the Bells will greatly intensify, and that it will change in form from a nettlesome battle over the terms of government mandated resale competition to a franchise-threatening war of intermodal access competition from cable, wireless, Wi-Fi/ wireless broadband, and Broadband over Powerlines. … The big takeaway is that regulation is no longer the driving force behind competition—technology is. '96–'00 was the Telecom Act–CLEC facilities competitive era. '00–present has been the FCC UNE-P competitive resale era. Precursor believes '04 going forward increasingly will become the SIP/VoIP era, one that will enable emerging intermodal facilities competition from cable operators, power companies and wireless/wireless broadband providers."

Rudy Baca, *1.9GHz Spectrum Auction Unlikely to Facilitate Wireless Transition to Broadband*, Precursor Advisors (June 18, 2004) (emphasis omitted):

"Precursor believes that the auction of reclaimed NextWave (and other returned) licenses in the 1.9GHz band is unlikely to ease significantly the challenges facing the wireless sector in transitioning to next generation wireless broadband (WBB). Although 1.9GHz is prime unencumbered spectrum in key markets, political considerations and timing constraints are likely to result in the retention of 'Designated Entity' rules which restrict national carriers from bidding *directly* on spectrum, thereby artificially increasing their costs of acquiring this key resource, delaying deployment, and minimizing its efficacy for higher data rate services."

George Reed-Dellinger, *TeleMedia Update*, WASHINGTON ANALYSIS (June 15, 2004) (emphasis omitted):

"[T]he need for restructuring [telephone rates] has been mitigated by the policy announced by the Federal Communications Commission (FCC) related to the handling of VoIP (voice over Internet protocol) calls. Specifically, the FCC will require access charges to be paid by VoIP customers for calls transported over the public switched network, reducing the hemorrhaging of the BOCs that would have resulted from the extension of the MCI … and AT&T … routing schemes into the VoIP world. Absent these routing schemes, which MCI and AT&T use to avoid paying access charges, the need to restructure (eliminate) the access charge regime has lessened. Moreover, it may increasingly appear to the BOCs that they have their traditional competitors on the ropes and need not make compromises to gain support for a comprehensive rate-restructuring plan."

APPENDIX III
REVIEW OF STUDIES CONCERNING THE ECONOMIC EFFECTS OF TELECOMMUNICATIONS REGULATION

1. Cambridge Strategic Management Group (2002)[288]

This study uses an accounting approach with individual company survey data. The authors find that TELRIC-based pricing both raises the cost and reduces the revenue to ILECs that may be considering the deployment of fiber to the home. They calculate the reduction in the percentage of households for which it would be profitable to make this deployment under different regulatory regimes. They estimate that ILECs might spend an additional $39 billion over ten years if they were sure they would not have to make their lines available to competitors at unprofitable rates.

2. Crandall, Ingraham, and Singer (2004)[289]

This study uses a factor-demand approach to model CLEC investment decisions to test the "stepping stone" theory that low UNE rates encourage CLEC investment. The authors use cross-state regressions to estimate the output-constant elasticity of substitution between facility-based investment and UNE leasing. They find that "facilities-based line growth relative to UNE growth was faster in states where the cost of UNEs was higher relative to the cost of facilities-based lines."[290] Their estimates, based on a number of different specifications, indicate that each 1 percent increase in the price of leasing a UNE line, relative to the cost of adding a facilities-based line, is associated with an increase of facilities-based lines, relative to leased lines, of between 0.5 and 1.6 percent.

The authors conclude that "the best argument for maintaining the current unbundling regime—namely, that low UNE rates encourage CLECs to rent at first, and then build facilities once they have some market experience—is not supported by the data."[291]

3. Crandall and Jackson (2003)[292]

This study attempts to estimate the eventual economic benefits of broadband technology. The authors use two approaches. First, they estimate the addition to

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288 *Assessing the Impact of Regulation on Deployment of Fiber to the Home*, 5 CAMBRIDGE STRATEGIC MANAGEMENT GROUP (Apr. 2002).

289 Robert W. Crandall, Allan T. Ingraham, and Hal J. Singer, *Do Unbundling Policies Discourage CLEC Facilities-Based Investment?* 4 TOPICS IN ECON. ANALYSIS & POL'Y 1 (2004).

290 *Id.*

291 *Id.*

292 ROBERT W. CRANDALL AND CHARLES L. JACKSON, THE $500 BILLION OPPORTUNITY: THE POTENTIAL ECONOMIC BENEFIT OF WIDESPREAD DIFFUSION OF BROADBAND INTERNET ACCESS. DOWN TO THE WIRE: STUDIES IN THE DIFFUSION AND REGULATION OF TELECOMMUNICATIONS TECHNOLOGIES (Nova Science Press, 2003).

consumer welfare, or consumer surplus, which would accompany ubiquitous high-speed access available for $40 per month per household. Second, they identify specific benefits that high-speed access can ultimately provide consumers, such as reduced shopping time, improved entertainment choices, enhanced telephone services, and improved healthcare.

Using estimates of the price elasticity of demand for broadband services of −1.0 and −1.5, the authors estimate total consumer benefits between $297 billion and $460 billion per year, comparable in size to the range of estimates of $272 billion to $520 billion per year for the alternative estimates of the consumer benefits deriving from specific activities. Accelerating the adoption of broadband could increase the present value of consumer benefits by a further $500 billion.

4. Crandall, Jackson, and Singer (2003)[293]

The purpose of this study is to estimate the impact of universal broadband adoption on consumers and on investment, employment, and economic growth. The authors conclude that ubiquitous (95 percent of households) adoption of current-generation (DSL and cable modem) technologies would generate $63.6 billion in capital expenditures ($0.97 billion per year on residential DSL and $2.38 billion per year on residential cable broadband for a total of $3.35 billion per year) over the next nineteen years. This would result in a cumulative increase in GDP of $179.7 billion and an additional 61,000 jobs.

The impact of more advanced technologies, such as fiber to the home, would generate an additional net $82.8 billion in capital spending ($4.34 billion per year) for a total of $146.4 billion in new capital spending over nineteen years, which would result in a total of 140,000 new jobs. More rapid adoption would increase capital spending by $164.7 billion over ten years and increase employment by 540,000 jobs by 2010. The authors estimate that broadband adoption could generate up to 664,000 jobs in upstream consumer industries, such as education, healthcare, and consumer electronics, which would bring total job creation up to 1.2 million. Finally, the authors estimate that universal broadband could generate between $72 billion and $300 billion per year in benefits to consumers by 2021, at which time they assume broadband service to be ubiquitous. This compares with their estimates of consumer surplus in 2001–2002 of between $6.5 billion and $9.5 billion per year.

[293] Robert W. Crandall, Charles L. Jackson, and Hal J. Singer, *The Effect of Ubiquitous Broadband Absorption on Investment, Jobs, and the U.S. Economy*, Criterion Economics New Millennium Research Council (2003).

5. Crandall and Singer (2003)[294]

This study provides a critique of a Phoenix Center study[295] that argued that the Telecommunications Act of 1996 added 92,000 wireline telecommunications jobs and reviews evidence on the impact of the 1996 act on capital spending, employment, and productivity in the telecommunications sector. Crandall and Singer conclude that CLECs have not added to output, that the growth of CLECs has not brought about a reduction in prices, and that telecommunications sector productivity growth has actually declined from 5.5 percent per year between 1990 and 1996 to 4.9 percent per year between 1996 and 2001.

The authors review the literature on the determinants of ILEC investment. They conclude that each additional line lost by an RBOC to a leased line reduces RBOC revenues by an average of $18.50, earnings by $15.50, and operating cash flow by $10.00, all on a per-month basis. They report regression results based on data from 1996 to 2002 that suggest that RBOC capital spending decreases by $0.81 for each dollar decline in operating cash flow. This implies that each line switched from an RBOC to a leased line results in a reduction in capital spending of $8.11 per year.

Using BEA multiplier estimates, the authors conclude that each 1 million lines transferred from an RBOC to leased lines reduces employment by 1,300 jobs. Based on the roughly 10 million UNE-P lines in December 2002, this implies 13,000 lost jobs. As a result, the authors conclude, much of the $60 billion invested by CLECs has been wasted.

6. Eisenach and Lenard (2003)[296]

This study surveys the existing literature on the effects of UNE regulations on telecommunications capital investment and concludes that the reform of current regulations would increase investment of ILECs, CLECS, and cable operators in telecommunications network assets by between $5.37 billion and $12.74 billion per year. The authors then estimate the impact of increased investment on output and jobs and conclude that UNE reform would increase GDP by between $71.5 billion and $169.5 billion and increase employment by between 470,000 and 1,115,000 jobs over five years, without considering any additional benefits the increased capital spending would have on productivity growth or equity values.

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294 Robert W. Crandall and Hal J. Singer, *An Accurate Scorecard of the Telecommunications Act of 1996: Rejoinder to the Phoenix Center Study No. 7*, Criterion Economics New Millennium Research Council (2003).

295 *The Positive Effects of Competition on Employment in the Telecommunications Industry*, PHOENIX CENTER POLICY BULL. No. 7 (2003).

296 Jeffrey A. Eisenach and Thomas M. Lenard, *Telecom Deregulation and the Economy: The Impact of "UNE-P" on Jobs, Investment, and Growth*, 10 PROGRESS AND FREEDOM FOUNDATION (2003).

7. Eisenach, Lowengrub, and Miller (2003)[297]

This study analyzes the impact of three separate regulatory events on the market values of companies in the telecommunications sector. The first was FCC Chairman Michael Powell's announcement on January 29, 2002, that the FCC would hold a vote concerning new unbundling rules, which investors interpreted as increasing the probability that UNE-P rules would be relaxed. The second was the FCC's announcement on February 10, 2003, that the vote would be delayed, which was interpreted as a reversal of the earlier announcement. The third was the FCC's vote on February 20, 2003, to approve new unbundling requirements, which dramatically decreased incentives for both incumbents and CLECs to invest in new facilities.[298] The authors conclude that the cumulative effects of the FCC announcements reduced the market value of the incumbent phone carriers by 12 percent, or $19.2 billion, indicating that the market interpreted the new rules as a disincentive to invest, which would reduce the present value of the firms' future capital expenditures by approximately $16.3 billion.

8. Eisner and Lehman (2001)[299]

This study looks at the effect of UNE prices on CLEC facilities-based entry. The authors conclude that each $1 increase in the statewide average UNE rate results in 3,741 new CLEC facilities-based lines.

9. Haring, Rettle, Rohlfs, and Shooshan (2002)[300]

This study uses regression analysis of cross-section data to estimate the significance of factors determining RBOC investment. The authors find that every dollar added to the price that RBOCs can charge for leasing a loop adds $18 to net plant and equipment of the ILECs. Spending to achieve this level would come to $30 billion over three years.

10. Haring and Rohlfs (2002)[301]

The authors argue that the effect of unbundling requirements is to expropriate a valuable real option from ILECs and bestow it on competitors. The reason is that unbundling policies inherently diminish the upside potential of risky investments but do not afford comparable protection on the downside. Thereby, unbundling requirements

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297 Jeffrey A. Eisenach, P. Lowengrub, and James C. Miller III, *Economic Implications of the FCC's UNE Decision: An Event Analysis Study*, Capanalysis Group (2003).

298 Federal Communications Commission, Press Release, *FCC Adopts New Rules for Network Unbundling Obligations of Incumbent Local Phone Carriers* (2003).

299 James Eisner and Dale E. Lehman, *Regulatory Behavior and Competitive Entry*, 14th Annual Western Conference, Center for Research in Regulated Industries (June 28, 2001).

300 John Haring, M. L. Rettle, Jeffrey Rohlfs, and Harry M. Shooshan, *UNE Prices and Telecommunications Investment*, Strategic Policy Research (2002).

301 John Haring and Jeffrey Rohlfs, *The Disincentives for ILEC Broadband Investment Afforded by Unbundling Requirements*, Strategic Policy Research (July 16, 2002).

substantially reduce the expected returns from such investments, a phenomenon known as the "real option effect."

Given the loss of this real option, ILEC infrastructure investments to support mass DSL deployment are generally unprofitable and unlikely to be made. The authors use the example of SBC's Project Pronto, a $6 billion planned investment to bring DSL to a thirteen-state market. On the basis of SBC's experience with Pronto Project, which was aborted in late 2001 because of new unbundling regulations imposed by state regulators, the authors estimate that unbundling requirements are likely to deter $20 billion or more of ILEC investment for mass DSL deployment.

11. Hasset and Kotlikoff (2002)[302]

This study evaluates the impact of network sharing required by the Telecommunications Act of 1996 on the investment behavior of ILECs and CLECs. Hassett and Kotlikoff review empirical evidence and the results of other studies, present a textbook model of regulated monopoly behavior, and use the results of a dynamic game to illustrate possible effects of regulation on the investment and market entry decisions of ILECs and CLECs. The authors conclude that, when properly enforced, the Telecommunications Act of 1996 leads to reductions in telecommunications prices, savings for consumers, and increases in telecommunications investment by both ILECs and CLECs. They argue that rigorous enforcement of the Telecommunications Act of 1996 could restore the depressed levels of telecommunications investment to those seen in the late 1990s.

12. Lehman (2002)[303]

Lehman reports that initial UNE rates averaged $5, or 25 percent, below actual, embedded costs. He also estimates a cross-section regression model to show the impact of UNE rates on investment in high-speed networks by both ILECs and cable companies. He finds that each $1 increase in the UNE rate will yield 5,048 new high-speed lines.

13. Ingraham and Sidak (2003)[304]

This study tests the Jorde-Sidak-Teece hypothesis that mandatory unbundling at TELRIC prices harms ILEC investment because it increases the ILEC's cost of equity capital by increasing risk and volatility of returns. Using daily returns between January 1996 and December 2002, the authors estimate that the regional Bell companies experienced significantly higher stock price volatility during recessions than during

302 Kevin A. Hassett and Laurence J. Kotlikoff, *The Role of Competition in Stimulating Telecom Investment*, American Enterprise Institute (2002).

303 Dale Lehman, *The Court's Divide*, 1 REV. NETWORK ECON. 106 (2002).

304 Allan T. Ingraham and J. Gregory Sidak, *Mandatory Unbundling, UNE-P, and the Cost of Equity: Does TELRIC Pricing Increase Risk for Incumbent Local Exchange Carriers?* Criterion Economics (2003).

expansions, a result that increased the RBOC's equity costs of capital by between 0.39 and 4.13 percent.

The authors further test an implication of the hypothesis that the stock prices of the regional Bell companies experienced positive abnormal returns following a front-page story in the *Wall Street Journal* on January 6, 2003, indicating that FCC Chairman Michael Powell would effectively end UNE-P by dramatically reducing the number of elements that ILECs must offer to lease to competitors on an unbundled basis at TELRIC prices.

The authors find that the 8.4 percent increase ($18.8 billion) in the market value of the four regional Bell companies and the 8.3 percent increase ($1.5 billion) in the market value of an index of telecommunications equipment stocks on the day of the announcement represent statistically significant positive abnormal returns. They conclude that mandatory unbundling at TELRIC prices has decreased the ILECs' incentives to invest in their own networks.

14. Phoenix Center Policy Bulletin No. 5 (2003)[305]

This study examines the impact of UNE-P on RBOC investment behavior in states served by BellSouth, SBC, and Verizon from 2000 through 2002. Using an econometric model to quantify the relationship between UNE-P and the operating companies' investments in telecommunications plant, the authors conclude that a positive relationship exists between UNE-P and investment. According to the authors, each additional UNE-P access line increased operating company average net investment by $759 per year (6.4 percent).

15. Phoenix Center Policy Bulletin No. 7 (2003)[306]

This study evaluates the contribution of ILECs and CLECs to wireline employment following the passage of the Telecommunications Act of 1996 by comparing actual employment with a trend line based on the January 1990 to July 2003 period. The authors conclude that, while overall industry employment declined because of the recession and collapse of the Internet bubble, the growth of CLECs due to UNEs has added about 92,000 jobs to the wireline telecommunications segment. This represents a 17 percent increase over the trend line.

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[305] *Competition and Bell Company Investment in Telecommunications Plant: The Effects of UNE-P*, PHOENIX CENTER POLICY BULL. No. 5 (2003).

[306] *The Positive Effects of Competition on Employment in the Telecommunications Industry*, PHOENIX CENTER POLICY BULL. No. 7 (2003).

16. Pindyck (2004)[307]

This study examines the effect of the network-sharing arrangements mandated by the Telecommunications Act of 1996 on ILEC investment incentives. Pindyck states that the sharing rules, though intended to promote competition, in fact reduce incentives to build new networks or upgrade existing ones because of the investments' irreversible sunk costs. Entrants do not bear these sunk costs because of the flexibility and extensive nature of the sharing opportunities. The resulting asymmetric allocation of risk and return is not accounted for in the current pricing system. Because the incumbents' network investments are readily available to competitors at rates that do not fully compensate the incumbents for the opportunity costs of their investments, these sharing rules significantly lower investment incentives. Pindyck concludes that current network-sharing rules ignore the impact of the irreversibility of capital investment and reduce incentives to invest and thus negatively affect the welfare of consumers of telecommunications services.

17. Pociask (2002)[308]

This study estimates the impact of building a nationwide broadband network on the U.S. economy. Pociask concludes that building a new nationwide network would generate $270 billion, or $35.2 billion per year, in additional investment spending over an eight-year period. The additional investment would expand employment by a total of 1.2 million jobs, including 166,000 jobs in the telecommunications sector, 71,700 jobs in the telecommunications equipment and customer premise equipment manufacturing industries, and 974,000 indirect jobs in other industries.

18. Pociask (2004)[309]

This study estimates the impact of increasing broadband taxes by 10.9 percent, from 6 to 16.9 percent, on the transport services DSL providers use to serve their customers. After reviewing the literature, Pociask uses an estimate of the price elasticity of DSL demand of −1.5 to project that the assumed tax increase would decrease DSL revenue by $2.5 billion and after-tax DSL revenue by $10.3 billion over five years. Based on an industry average of $223,000 of revenues per employee, this implies a loss of 11,900 telecommunications industry jobs, including 7,600 union jobs, in the fifth year after the tax increase, without considering the resulting reduction in industry capital spending and further loss of jobs in other industries that these reductions would cause.

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307 Robert S. Pindyck, *Mandatory Unbundling and Irreversible Investment in Telecom Networks*, NBER WORKING PAPER w10287 (Feb. 2004).

308 Stephen Pociask, *Building a Nationwide Broadband Network: Speeding Job Growth*, TeleNomic Research (2002).

309 Stephen Pociask, *Taxing High-Speed Services: A Quantification of the Effects on the DSL Industry and Universal Service*, New Millennium Research Council (2004).

19. Sinai (2004)[310]

This study analyzes the potential impact of the FCC's Triennial Review (February 2003) and the decision of the U.S. Court of Appeals for the D.C. Circuit regarding CLECs' use of UNEs (March 2004) on RBOC and CLEC investments. Together, the FCC review and the appeals court decision resulted in the elimination of the unbundling rules in the Telecommunications Act of 1996. Assuming these changes to be permanent, Sinai estimates the impact on growth, capital spending, and jobs. He concludes that these policy changes will increase real GDP by $14.8 billion annually, add $6.8 billion per year in capital expenditures from 2004 to 2008, create an average of 91,000 additional jobs from 2004 to 2008, and decrease the federal budget deficit through increased tax receipts.

20. Willig (2002)[311]

In his declaration to the FCC on behalf of AT&T, Willig addresses the effects of the unbundling and pricing rules of the Telecommunications Act of 1996 on investment in facilities by both CLECs and ILECs. Willig argues in favor of retaining existing UNEs, eliminating existing restrictions that limit access to certain UNEs, and rejecting proposals that would adopt new "granular" restrictions. He concludes that the existing restrictions have negatively affected CLECs in several ways. The restrictions, according to Willig, have prevented service offerings, inhibited investment, contributed to bankruptcies, raised costs through litigation, and inhibited the raising of new capital.

21. Willig, Lehr, Bigelow, and Levinson (2002)[312]

This study analyzes the impact of the unbundling rules in the Telecommunications Act of 1996 on the investment behavior of ILECs. The authors review the theoretical arguments for and against UNE rules and present an empirical analysis using CLEC and ILEC investment data in the period since the act's passage. The authors conclude that mandatory unbundling provisions do not deter ILEC investment. They estimate that a 1 percent reduction in UNE rates corresponds to a 2.1 to 2.9 percent increase in ILEC investment and argue that the unbundling of ILEC networks stimulates investment by both ILECs and CLECs.

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310 Allen Sinai, *Macroeconomic Effects of Telecommunications Deregulation*, Decision Economics, Inc. (2004).

311 Declaration of Robert D. Willig, Attachment F to Comments of AT&T Corporation, CC Docket Nos. 01-338, 96-98, and 98-147, Federal Communications Commission (Apr. 5, 2002).

312 Robert D. Willig, William H. Lehr, J. P. Bigelow, and Stephen B. Levinson, *Stimulating Investment and the Telecommunications Act of 1996* (2002).

APPENDIX IV
GLOSSARY

ADSL – Asymmetric Digital Subscriber Line – This is a method for moving data over regular phone lines. An ADSL circuit is much faster than a regular phone connection, and the wires coming into the subscriber's premises are the same (copper) wires used for regular phone service. An ADSL circuit must be configured to connect two specific locations, similar to a leased line. A commonly discussed configuration of ADSL would allow a subscriber to receive data (download) at speeds of up to 1.544 megabits per second and to send (upload) data at speeds of 128 kilobits per second. Thus, the "asymmetric" part of the acronym.

BEA – Bureau of Economic Analysis – The BEA is part of the Economics and Statistics Administration of the Department of Commerce. The BEA collects source data, conducts research and analysis, develops and implements estimation methodologies, and disseminates economic accounts statistics, including the national income and product accounts (NIPAs), to the public.

BOC – Bell Operating Company – This is a term for any of the Bell System's twenty-two original operating companies (or their successors) that a U.S. federal court consent decree allowed to continue to provide local exchange telephone service within a specific geographic area. The decree, which broke up the Bell System on January 1, 1984, divested these companies from AT&T (and its manufacturing and research and development entities) to create competition in long-distance service. The decree initially prevented the BOCs from manufacturing equipment or providing long-distance service. The Telecommunications Act of 1996 forced the BOCs to open their local markets to competition and now permits the firms to engage in long-distance business under certain circumstances.

BPL – Broadband over Power Lines – This is a technology that uses electrical wires, both transmission wires and in-home wiring, to transmit data. It uses the copper wires as a conduit for radio waves, in much the same way as coaxial cable does.

BSP – Broadband Service Provider – BSPs are cable system overbuilders. BSPs deploy modern broadband systems that typically offer video, Internet access, and voice services.

CAP – Competitive Access Provider – This is the name for a CLEC before passage of the Telecommunications Act of 1996.

Circuit Switching – This is a switching architecture that always holds the connection between telephones open to provide a continuous communication channel.

CLEC – Competitive Local Exchange Carrier – A CLEC is a company that competes with the already established local telephone company. The term distinguishes a new or potential competitor from an incumbent local exchange carrier (ILEC).

CM – Cable Modem – A cable modem is the box that connects a user's computer or home network to the cable system's data network.

CMRS – Commercial Mobile Radio Services – These include mobile phone and paging services that firms sell to the public or businesses. CMRS are provided under common carriage.

Colocation – Colocation is an arrangement in which a server that belongs to one person or group is physically located on an Internet-connected network that belongs to another person or group. Usually this is done because the server owner wants its machine to be on a high-speed Internet connection and/or does not want the security risks of having the server on its own network.

CPE – Customer Premises Equipment – This term denotes terminal and associated equipment and inside wiring located at the subscriber's premises and connected with a carrier's network.

CTIA – Cellular Telecommunications and Internet Association – The CTIA is the international wireless communications trade association.

DBS – Direct Broadcast Satellite – DBS refers to a high-powered satellite video service that is characterized by the smaller satellite dishes used to receive the signal.

DSL – Digital Subscriber Line – This is a technology that brings broadband data to homes and small businesses over ordinary copper telephone lines. A DSL line can carry both data and voice signals, and the data part of the line is continuously connected. See ADSL for the most common version of DSL.

FCC – Federal Communications Commission – The FCC is an agency established by the Communications Act of 1934 and charged with regulating interstate and international communications by radio, television, wire, satellite, and cable. The FCC's jurisdiction covers the fifty states, the District of Columbia, and U.S. possessions. An independent U.S. government agency, the FCC is directly responsible to Congress.

FTTH – Fiber to the Home / FTTP – Fiber to the Premises – These terms refer to a network in which high-capacity fiber-optic cabling is brought to each house, rather than to larger neighborhoods. The technology provides voice, data, and video services from the phone company's branch office to local customers' residences or businesses.

HSD – High-Speed Data – Also known as broadband, this term refers most commonly to a new generation of high-speed transmission services that allows users to access the Internet and Internet-related services at speeds about 100 times faster than traditional modems.

ICT – Information and Communications Technology – ICT includes any communication device or application, encompassing radio, television, cellular phones, computer and network hardware and software, and satellite systems, as well as the various services and applications associated with them, such as videoconferencing and distance learning.

ILEC – Incumbent Local Exchange Carrier – An ILEC is a telephone company that was providing local service when the Telecommunications Act of 1996 was enacted. ILECs include the former Bell operating companies, which were grouped into holding companies known collectively as the regional Bell operating companies when a 1982 federal court consent decree broke up the Bell System, in 1984. ILECs are in contradistinction to CLECs (competitive local exchange carriers).

IntraLATA Service – This is telecommunications service that originates and terminates within the same local access and transport area (LATA). Customers may elect to have either the local phone company or a long-distance company carry these calls. IntraLATA service is sometimes called local long-distance.

IP – Internet Protocol – IP is the method or protocol by which data are sent from one computer to another on the Internet. Each computer (known as a host) on the Internet has at least one IP address that uniquely identifies it to distinguish it from all other computers on the Internet.

ISDN – Integrated Services Digital Network – ISDN is a set of standards for digital transmission over ordinary telephone copper wire. In contrast to DSL, ISDN does not allow normal phone service over the same line without digital adapters and transmits data at a rate of speed higher than a traditional telephone modem, but below broadband rates.

ISP – Internet Service Provider – This is a company like Earthlink, AOL, or MSN that offers a service connecting users to the Internet.

IT – Information Technology – IT is a term that encompasses all forms of telephony and computer technology employed to create, store, exchange, and use information in its various forms (business data, voice conversations, still images, motion pictures, multimedia presentations, and other forms).

ITFS – Instructional Television Fixed Service – This refers to a service provided over a band of microwave frequencies set aside by the FCC exclusively for the transmission of educational programming. The service allows broadcast of audio, video, and data to receiving sites located within twenty miles of the point of origination. The receiving sites require a converter that changes signals to those used by a standard television set. See MMDS for companion service.

ITU – International Telecommunications Union – The ITU is an international organization within the United Nations in which governments and the private sector coordinate global telecom networks and services.

IXC – Interexchange Carrier – This is a long-distance company.

LAN – Local Area Network – A LAN is a group of computers and associated devices that share a common communications line or wireless link and typically share the resources of a single processor or server within a small geographic area (for example, within an office building). Usually, the server has applications and data storage that multiple computer users share.

LATA – Local Access and Transport Area – A geographical area within which a Bell operating company is permitted to offer exchange telecommunications and exchange access services. Under the terms of the U.S. federal court consent decree that broke up the Bell System, the BOCs were generally prohibited from providing services that originate in one LATA and terminate in another.

LEC – Local Exchange Carrier – A LEC is a telephone company that provides local phone service. LECs are either incumbents (ILECs) or entrants (CLECs).

Local Loop – The local loop traditionally refers to the copper wire connection from a telephone company's central office to a customer's home or business. Sometimes referred to as a "twisted pair," the traditional local loop is literally a loop of copper that creates a circuit when a telephone handle is picked up.

MMDS – Multipoint Microwave Distribution System (also known as Multichannel Multipoint Distribution System and Wireless Cable) – MMDS channels come in six MHz chunks and run on frequencies licensed exclusively by the Federal Communications Commission. MMDS is a line-of-sight service, so it will not work well around mountains, but it will work in rural areas, where copper lines are not available.

MOU – Minutes of Use – MOU is a metric often used in telecom.

MSS – Mobile Satellite Service – This is a communications transmission service provided by satellites. A single satellite can provide coverage to the entire United States.

MVNO – Mobile Virtual Network Operator – An MVNO is a firm that markets wireless services under its own brand name but uses another carrier's infrastructure.

MVPD – Multichannel Video Programming Delivery – MVPD refers to the delivery of video programming via cable, DBS, or MMDS systems.

NOPAT – Net Operating Profit after Taxes – NOPAT is a profitability measure that omits the cost of debt financing (i.e., it omits interest payments, along with their associated tax break). NOPAT is primarily used in the calculation of economic value added.

NTIA – National Telecommunications and Information Agency – The NTIA, a part of the Department of Commerce, is the counterpart to the FCC that oversees the federal government's use of radio spectrum.

OECD – Organization for Economic Cooperation and Development – The OECD is a group of thirty countries with democratic governments and market economies.

Packet Switching – Packet switching refers to an architecture in which digital information is broken into small packets that are transmitted over a network and reassembled at the receiving end of the transmission. The data in the transport network travel over no particular channel. The Internet is a packet-switched network.

PCS – Personal Communications Services – This is an FCC term that describes a set of digital cellular technologies deployed in the United States. Three of the most important distinguishing features of PCS systems are: they are completely digital; they operate at the 1,900 MHz frequency range (unlike other cellular systems that operate in the 800 MHz frequency range); and they can be used internationally.

POTS – Plain Old Telephone Service – This is the standard telephone service that most homes use. In contrast, telephone services based on high-speed, digital communications lines are not POTS. The main distinctions between POTS and non-POTS services are speed and bandwidth. POTS is generally restricted to about 52,000 bits per second.

RBOC – Regional Bell Operating Company – This term describes one of the U.S. regional telephone companies (or their successors) that were created as a result of the breakup of AT&T by a federal court consent decree on January 1, 1984. The seven original regional Bell operating companies were Ameritech, Bell Atlantic, BellSouth, NYNEX, Pacific Bell, Southwestern Bell, and US West. Each of these companies owned at least two Bell operating companies (BOCs). Today, via several mergers and acquisitions, only four RBOCs remain—SBC, BellSouth, Qwest, and Verizon.

ROIC – Return on Invested Capital – ROIC equals NOPAT divided by invested capital.

Section 251 – Section 251 of the Telecommunications Act of 1996 seeks to foster competition in the local telephone market by requiring incumbent local exchange carriers to make their facilities available to competing local exchange carriers. Specifically, Section 251 directs ILECs to interconnect with CLECs on reasonable terms, make unbundled network elements available to CLECs on just, reasonable, and nondiscriminatory terms, or make any service the ILEC offers at retail available to CLECs at a reasonable discount.

SIP – Session Initiation Protocol – This very simple, text-based, application-layer control protocol creates, modifies, and terminates sessions with one or more participants. Such sessions include Internet telephony and multimedia conferences.

SMR – Specialized Mobile Radio – This is a land-based radio service, established in the late 1970s in the United States, that provides one-to-many and many-to-one communications. SMR has also been called trunked radio or public access mobile radio.

SMR systems are designed to help roaming field personnel stay in touch with the home office and are often called "dispatch services."

Telecommunications Act of 1996 – The Telecommunications Act of 1996, signed into law on February 8, 1996, provided major changes in laws affecting cable TV, telecommunications, and the Internet. The law's primary purpose was to stimulate competition in telecommunications services by specifying how local telephone carriers can compete and how and under what circumstances local exchange carriers can provide long-distance services as well as requiring the deregulation of cable TV rates.

TELRIC – Total Element Long-Run Incremental Cost – This is a pricing formula established by the FCC as part of its implementation of the Telecommunications Act of 1996 to set the prices that ILECs may charge competitors to lease the unbundled network elements from the local phone network. The Telecommunications Act of 1996 requires that prices paid by competitors to access incumbent's networks be "cost-based." TELRIC is a forward-looking cost approach that considers the costs that would be incurred from a hypothetical, perfectly efficient future network.

TELRIC-BS – TELRIC-Blank Slate – This is the label economist and former regulator Alfred E. Kahn has given to the FCC's pricing formula for UNEs. The BS component stands for "blank slate," because he argues that regulators ignore the ILEC's actual costs and instead adopt the costs of a hypothetical, most efficient new entrant.

TIA – Telecommunications Industry Association – The TIA is the leading U.S. nonprofit trade association serving the communications and information technology industry.

TRO – Triennial Review Order – On August 21, 2003, the FCC issued its Triennial Review Order, the final order in a proceeding concerning a triennial review of its rules governing competition for local telephone service (established by the Telecommunications Act of 1996). The Triennial Review Order, in part, generally preserved the FCC's unbundled network element rules. It also set forth an impairment standard for determinations on network unbundling requirements and gave the states a substantial role in applying this standard according to specific guidelines.

TSR – Total Service Resale – TSR refers to one of the two options available to competitive local exchange carriers to enter the local phone service market by using the incumbent local exchange carrier's network (the other is by using unbundled network elements). In the case of TSR, the ILEC's network is provided to CLECs at a price based on the "retail" tariff price, minus a fixed percentage "discount" (typically in the 20–25 percent range).

UHF – Ultra-High Frequency – This refers to the frequency range between 300 MHz and 3.0 GHz, which is a higher band than the very high frequency band. UHF and VHF are the most common frequency bands for television.

UNE – Unbundled Network Element – The Telecommunications Act of 1996 required the incumbent to make access to its network available to competitors at technically feasible points. Unbundled network elements comprise loops, the network interface device, local circuit switching, dedicated and shared transport, signaling and call-related databases, and operations support systems.

UNE-L – Unbundled Network Element-Loop – UNE-L refers to the unbundled network element that is the copper loop to the home.

UNE-P – Unbundled Network Element-Platform – UNE-P is a combination of UNEs that allow end-to-end service delivery without any facilities—a rebundling of the UNEs.

USF – Universal Service Fund – This fund is required by the Telecommunications Act of 1996 to offset higher operational costs of some local exchange carriers, primarily in rural areas. The fund is supported by a fee charged to telephone subscribers that is set by the FCC.

VHF – Very High Frequency – This band has frequencies that range from 30 MHz (wavelength 10 m) to 300 MHz (wavelength 1 m). Common uses for VHF are FM radio broadcast at 88–108 MHz and television broadcast (together with UHF). VHF is also commonly used for terrestrial navigation systems and aircraft communications.

VoIP – Voice over Internet Protocol – This term refers to the delivery of voice information in the language of the Internet, i.e., as digital packets instead of the current circuit protocols of the copper-based phone networks. In VoIP systems, analog voice messages are digitized and transmitted as a stream of data (not sound) packets that are reassembled and converted back into a voice signal at their destination. With VoIP, a PC becomes a phone, and one can call anywhere in the world for the cost of a local call.

WACC – Weighted Average Cost of Capital – WACC is used in finance to measure a firm's opportunity cost of capital. It is calculated by multiplying the cost of each capital component (equity, debt) by its proportional weighting and then by summing.

xDSL – This refers to any type of digital subscriber line. See DSL and ADSL.