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Charles Ferguson and the “Broadband Problem”

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Executive Summary

Charles Ferguson has published a book that advocates a major increase in government intervention in the U.S. market for high-speed, “broadband” Internet services. His proposals are based on a faulty understanding of the effects of current telecommunications regulation and unsubstantiated claims that current participants in the broadband marketplace are exercising monopoly power. His policy recommendations would not only fail to accelerate the pace of broadband diffusion in the United States, but they would surely provide a disincentive for carriers to invest in the network upgrades required to extend broadband and to provide even higher-speed Internet access for U.S. consumers.

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1. Introduction

This month, The Brookings Institution released a book on the “Broadband Problem” by Charles Ferguson, a non-resident Brookings fellow.¹ This book provides a perspective on the reasons for the allegedly slow technological progress in the U.S. communications sector and the resultant lag of the U.S. behind Korea, Canada, and Japan in the spread of mass-market high-speed (“broadband”) Internet services. Because Ferguson’s views are so different from those of mine and of many other economists who have contributed to the applied economics literature in this area, I believe that it is necessary to provide a different perspective in the form of a brief review of the book. While there are reasons to worry about the performance of the U.S. telecommunications sector, I do not believe that the book provides us with the analytical framework or empirical insights on the extant problems and their likely solutions. Indeed, some of its policy prescriptions would be extremely counterproductive.

2. The “Monopoly” Problem in Communications

When Ferguson looks at the performance of the U.S. communications sector – in particular, telecommunications and cable television – his frame of reference is high technology, *i.e.*, computers, semiconductors, and a variety of other electronic equipment. As a result, telephone companies and cable television systems are portrayed as tired, old “monopolists,” even though they compete with one another in the market for the new broadband services.

But telecom and cable are only *consumers* of the output of these high-tech sectors, they are not generally in the business of pushing out technological frontiers through their own research efforts. When I and many other economists look at the communications sector, we see regulated industries. We have studied the impacts of regulation in the railroad, trucking, airline, electric-utility, and petroleum industries, and we understand the extremely adverse incentives

¹ Charles H. Ferguson, *The Broadband Problem: Anatomy of a Market Failure and a Policy Dilemma*. Brookings, 2004.

created by regulation. We do not expect such industries to be technologically dynamic until they are deregulated, but – for various reasons – Ferguson wants to continue and even extend broadband regulation. Nor do we expect regulation to generate competition.

Regulators love monopolies because monopoly not only justifies their existence, but it provides them the rents that they can move around among various politically-influential interest groups. Telecommunications regulation, in particular, has slowly been transformed into a system of taxation and subsidization that annually directs at least \$20 billion to a host of these interest groups. Fortunately, the United States has been moving away from regulation in transportation, energy, and even communications, but much regulation remains, particularly in telecommunications. Ferguson blames what he believes to be slow technical progress in the communications sector and the inadequate spread of broadband Internet services on the sluggish “monopolists,” namely, the cable companies and local telephone carriers. Both of these groups have surely enjoyed a monopoly position at one time or another *because of* regulation, but both now find themselves in intense competitive struggles, particularly since the 1996 Telecommunications Act lifted many of regulatory barriers to entry in the markets they serve. Unfortunately, the 1996 Act also created a nightmare of new telecom regulation that has made investment by many of these companies much more risky.

Whatever one thinks of the companies that now populate the cable television and telecom sectors, one surely can no longer describe them as passive or somnolent “monopolists.” Where are the telephone-company monopolies? Surely, not in traditional voice services, which are being overwhelmed by competition from wireless companies, new local competitors, and -- more recently – from Internet telephony. As a result, the stock market values the Bell companies’ fixed-wire operations at no more than the cost of reproducing their assets, suggesting that they earn no monopoly profits.

Ferguson’s analysis does not focus on the most important reason for the telephone companies to pursue broadband customers aggressively, namely, that traditional voice revenues in the wire-based telephone companies are now in rather steep decline because of competition. This may be surprising to the reader because he shows in Figure 3-1 that local residential rates rose modestly between 1986 and 2001. However, a careful look at Federal Communications Commission (FCC) data provides a different conclusion. When one strips away the increases in regulatory-driven taxes and surcharges and deflates the data by the Consumer Price Index, one

finds that local telephone rates have fallen by 3.2 percent per year over this 15-year period. Not bad for a tired old business with large sunk costs! Other residential rates, notably for long distance and wireless services, have fallen even more rapidly.

Ferguson also focuses his attention on the apparent stability of the prices of high-speed data services supplied by the “monopolistic” telephone companies to business customers. He does not have much price data to cite, a shortcoming he attributes to poor supervision by the regulators and the Bell companies’ reluctance to co-operate with his investigations, but he nevertheless concludes that these prices “seem to be extraordinarily high.” (p. 68) These services are the ones for which new competitors built facilities in the 1997-2001 period, repeatedly digging up the urban streets in most major U.S. metropolitan areas. It would be surprising indeed if the prices of these services have not fallen substantially due to this new competition. Nevertheless, Ferguson may be right that regulators have let the telephone companies charge prices that exceed costs for these services in the remaining non-competitive areas in order to cross-subsidize local residential rates. This “universal service” policy is ill-advised and extremely inefficient, but it is not the result of greedy, slothful monopolists. Instead, it is driven by politically-responsive regulators.²

Ferguson repeats the charge made by others that the incumbent Bell companies have failed to innovate and build new broadband capacity because they do not want to “cannibalize” their “monopoly” business services, but he does not substantiate this charge with empirical evidence. He even suggests that these Bell companies have impeded the development of Internet telephony (p. 69) for this reason. In fact, the 1996 Act’s restrictions on the Bell companies’ participation in long-distance markets essentially precluded them from developing such a service. Surprisingly, he does not ask why cable companies have not moved rapidly to develop Internet telephony. After all, the cable companies do not yet have much telephone revenue to cannibalize. The answer would appear rather straightforward: the cable companies, having been burned badly by regulation in the 1970s and then again in the early 1990s, have avoided the regulated telephone service business like a plague until very recently. They are now being dragged into it because other companies, such as Vonage, are using the cable companies’ own

² For an estimate of the costs of this policy, see Robert W. Crandall and Leonard Waverman, *Who Pays for Universal Service? When Telephone Subsidies Become Transparent*. Brookings, 2000.

broadband services to siphon telephone revenues from them. The cable companies cannot justify their inactivity in this area to their stockholders any longer.

3. The Broadband “Problem”

Two and one-half years ago, the AEI-Brookings Joint Center convened a conference on Broadband that attracted papers from a large number of the country’s leading economists. These papers looked at the regulatory and economic conditions that were driving the demand for and supply of mass-market broadband services from a number of different perspectives.³ None of these papers is cited or discussed in this book. Surprisingly, the economists who were most critical of the incumbent local (Bell) telephone companies saw no “problem” in the pace of U.S. broadband growth. This new medium was growing at least as rapidly as had most other earlier innovative consumer services or products, such as dial-up Internet service, personal computers, or cable television. They asked: What is the problem with 15 percent penetration five years after the introduction of a new service? Others came to a different conclusion, citing the effect of actual or potential regulation as the cause for the U.S. lagging behind Korea or, more importantly, Canada in the diffusion of broadband. Canada has virtually the same demographics and population density as the U.S., but much less onerous regulation of incumbent telephone companies’ and cable television firms’ provision of advanced broadband services. The result is that Canada’s broadband penetration (subscribers per 100 persons) is 60 percent above U.S. penetration,⁴ surely casting doubt on the proposition that more regulation would solve any U.S. broadband problem.

U.S. broadband subscriptions have apparently soared in the past year,⁵ rising from about 20 million in December 2002 to nearly 30 million at the end of last year, a surge not noted by Ferguson. Why has growth accelerated? We do not yet have definitive econometric estimates of all of the reasons, but we know of two factors that likely have been important. First, the Bell companies, when finally freed from the regulatory quarantine imposed by the 1996 Telecom Act that kept them out of interstate services, began cutting broadband and other prices in 2003. The

³ See Robert W. Crandall and James H. Alleman, *Broadband: Should We Regulate High-Speed Internet Access?*” AEI-Brookings Joint Center for Regulatory Studies, 2003.

⁴ Data for June 2003, available on the OECD website, www.oecd.org/sti/telecom.

⁵ The FCC has not yet published data for year-end 2003 subscribers.

cable companies responded by increasing the speed of their services, thus providing greater customer value for the same rate. This is far from the behavior that we would expect from tired old monopolists. Rather, it reflects increasing rivalry that has been unleashed by the substantial deregulation of the broadband market that occurred last year.

One may still argue that there may be a broadband “problem” in this country despite this surge in growth: U.S. broadband services could be faster and cheaper if regulators were to desist from mandating that competitors be allowed various forms of access to telephone companies’ or cable systems’ networks at subsidized rates. For telephone companies, this regulation has – until recently – required them to share their access lines with entrants or even to provide entrants their entire local telephone service at subsidized month-to-month rates. For cable companies, the threat of “open access” to competing Internet Service Providers (ISPs) has been bouncing around in state and federal courts for about four years. The FCC decided in February 2003 that requiring the telephone companies to share their access lines with competing broadband suppliers is counterproductive because it reduces the incentive for the telephone companies to invest in the requisite facilities. However, the legal appeals of even this ruling are still reverberating through the federal courts, prolonging the regulatory uncertainty and surely deterring investment.

4. Broadband Investment

How much have the allegedly laggard telephone companies and cable companies invested to bring us the wonder of the new services that have developed due to technological change created elsewhere? Ferguson tells us that the telephone companies were slow to invest until the late 1990s, but then increased capital spending “apparently the combined result of increased demand and of the competitive threat posed by AT&T, WorldCom, and emerging CLECs (competitive local exchange carriers).” (p. 58) But after 2001, he correctly points out, the incumbent Bell telephone companies reduced capital expenditures, a decline he attributes to the reduction of the competitive threat from the new local telephone companies who were failing rapidly. However, the book contains no evidence that Bell-company capital spending responded

to increases in local competition and fell when local competition abated. Indeed, the evidence is to the contrary.⁶

The new local competitors' share of local telephone lines soared in 2000-03 due to federal and state regulators' decisions, beginning in 1999-2000, to allow the entrants to lease *everything* from the Bell companies at about one-half the retail revenue-yield of these facilities.⁷ This subsidized access to their facilities diluted Bell company revenues, accelerated the decline into bankruptcy of the facilities-based entrants, and created the artificial illusion of growing "competition." In the three years before this new extended mandated-access policy began, the entrants had been able to garner only 8 million of the country's roughly 190 million access lines. With this new subsidy, the entrants – largely AT&T and MCI – have extended their reach in three and one-half years by another 18.8 million lines.⁸

As the regulators increasingly forced the Bell companies to provide all of their facilities to competitors at subsidized rates, the Bell companies naturally decided to scale back investment rather than taking an enormous beating on Wall Street. Surely, investors would not sanction a continuation of the 1999-2001 level of Bell company capital spending on the facilities required to deliver broadband if the Bells had to lease these new facilities to their competitors on a month-to-month basis at below-cost rates.⁹ Capital spending thus declined as competitors' lines soared – the precise opposite of Ferguson's conclusion.

The cable companies' early monopoly position was the result of restrictive local franchising decisions by municipal and state governments before 1984 federal legislation made

⁶ His only evidence in this regard is an informal reference to work performed by Robert Willig of Princeton University for AT&T that argues that Bell company investment in 1996-2000 or 1996-2001 was inversely related to regulated wholesale rates in 2000 or 2001. As I show in a forthcoming Brookings monograph, this effect is present only for 1996-99 investment, which could not have been guided by rates that had yet to be established in 2000 or 2001.

⁷ This policy is described by regulators as allowing entrants to lease the "unbundled network element platform" or UNE-P. This is a convenient euphemism for allowing the entrants to resell the entire service at subsidized rates, for the UNE-P involves *no unbundling whatsoever*.

⁸ Note that this surprising acceleration in the competitors' share is in sharp contrast to Ferguson's description of the "poor service" provided by incumbent telephone companies to the entrants on pp. 130-1. According to FCC statistics, the entrants have obtained 15 million of the 18.8 million increase in their access lines from the Bell companies at regulated resale and lease rates. There is no evidence that I am aware of – other than the usual word-of-mouth "complaints" cited by Ferguson -- that these companies could have grown any more rapidly under any conditions. The binding constraint on their growth is likely the low yield from their telemarketing expenditures, the only "investments" they make in local service.

⁹ Professor Jerry Hausman of MIT has written numerous articles on the "free option" granted by regulators to these entrants. See his paper on this subject in Crandall and Alleman (2003), cited above. I have also found in detailed econometric analysis to be published in a forthcoming Brookings book that Bell company capital spending did not rise with increases in CLEC penetration.

such monopoly grants illegal. In addition, cable television was protected from telephone-company competition by regulation for a period of time. Since then, the federal government has deregulated, re-regulated, and deregulated cable rates once again with obviously unsettling effects on investment. Fortunately, in the 1990s, new high-powered satellites were launched to provide hundreds of channels of video to households, forcing the cable companies to compete by investing heavily in network upgrades to expand their video offerings. This surge in network investment occurred at the dawn of the broadband Internet revolution, and the cable companies were able to use this opportunity to reconfigure their higher-capacity networks to deliver broadband (“cable modem”) service.

In March of this year, the U.S. Court of Appeals for the DC Circuit reversed the FCC’s rules that permitted entrants’ access to the entire complement of the Bell companies’ network facilities at subsidized rates. Equally important, the court left in place the FCC’s 2003 decision not to require the Bells to share their lines with competing broadband companies. Assuming that the Bush Administration has the good sense not to appeal this ruling to the Supreme Court, the Bell companies will now have both the cash flows and the incentives to expand their broadband networks rapidly. As a result, the local telephone companies and cable television operators will be able to compete, on largely an equal footing, in the market for broadband Internet services. Although cable companies enjoyed an early 2:1 lead over local telephone companies, due to cable’s network expansions in an unregulated environment to meet satellite competition while the telephone companies suffered from substantial regulatory burdens, this lead is now slowly eroding. Neither cable nor the local phone company has a monopoly position, as the FCC has noted in deregulating the telephone companies. Ferguson disagrees, arguing for even more regulation and more suppression of the incentives to invest.

5. Control of the Infrastructure

A complaint frequently advanced against high-tech companies is that their investments in new technologies or new “platforms,” when successful, provide them with first-mover advantages to control the upstream or downstream services delivered over those technologies or platforms. The recent antitrust case against Microsoft was replete with such charges although the U.S. Court of Appeals refused to bar Microsoft from bundling its Internet Explorer with its

Windows operating system because it accepted the theory that such bundling creates consumer benefits. Casual observers of current broadband policy offer similar concerns that, as of today, are largely based on flights of fancy. It is alleged that telephone companies and cable companies will control access to their broadband services to protect their own content, denying subscribers the benefits of the entrepreneurial genius of other new content providers. Ferguson is particularly concerned about cable companies' potential actions in this regard, for he sees the cable companies as eager to protect their existing video services base. But if they try to prevent their broadband users from streaming video that competes with the Food Channel or the Golf Channel, they will not only be denying themselves new subscribers and new sources of revenues, but they will be playing into the hands of their telephone company rivals who will surely want to exploit this new demand. And if these two rivals are slow to move, such services will be available over fixed wireless services or even potentially over spot-beam satellites. No one ever won the competitive race by protecting his outdated market base. After all, even Henry Ford began as a bicycle maker.

Some of those who participated and even profited from the early development of the Internet in the 1990s now believe that they have uncovered a new universal truth. Maintaining an "end-to-end" architecture for new networks to which everyone has open (and even free) access will maximize the value of such networks. Such open access and a uniform protocol for accessing these networks, similar to the IP/TCP protocol developed for the Internet, will cause thousands of flowers to bloom, as a famous Chinese leader fantasized 50 years ago. But the openness of the Internet was possible because it utilized the existing voice-based telephone network. No one had to spend billions of dollars to modify the connections to our homes and offices so that we could dial in at 2.4 to 50 kbs.

Broadband is very different because it requires billions of dollars in new network investment. If those who develop this infrastructure cannot profit from it, it is axiomatic that they will under-invest in it. Those who built the railroads in the late 1800s, the movie theaters in the interwar period, or broadcast stations in the post World War II era did not provide open access to their facilities. Even the common-carriage responsibility that has developed out of the common law does not require *free* and open access to the carrier's facilities. Because today's investment in the electronics, fiber optics, poles, and conduits required to deliver broadband Internet services

may soon be overwhelmed by superior new technology, those who invest in such facilities must be allowed to seek a return on them now.

The regulatory follies that have gripped U.S. telecommunications in recent years, including the call for open access, have greatly increased the risk of holding the carriers' equities. For a few years after the passage of the 1996 Telecom Act, the volatility in these equity prices, as measured by the "beta" coefficients of the capital asset pricing model, declined substantially. But after 2001, these beta estimates for all of the Bell companies soared, presumably in response to the regulators' decision to allow subsidized access to their entire networks. Historically, these companies had risk premiums that were equal to only about 60 percent of the average stock. Today, most of them are more risky than the average equity.

Cable television company equities have had a similar, but somewhat less dramatic rise in risk. If these companies are staid old "monopolists," why have they found themselves viewed by investors as much more risky in recent years? Surely, the turbulence in the regulatory arena must be at least partially responsible. Some of Ferguson's policy prescriptions, such as mandated open access, structural separation, and new antitrust prosecutions will do little to alleviate investors' fears and will not stimulate the investment that Ferguson and most other students of the industry agree that we need.

6. Is the Problem A Reflection of Inadequate Demand?

It may well be that Korea and Japan are ahead of the U.S. in the broadband race because their consumers have very different preferences from those in the U.S. Legend has it that millions of Koreans are holed up in their densely populated apartment buildings playing interactive online video games for hours. No one knows whether the Koreans' demand for broadband is much more intense than ours, but it may be. This would suggest that much of our purported broadband problem is a lack of demand. Surely, the new entrants into the delivery of U.S. broadband services have found that subscribers are not pounding on their doors for service.

One of the new competitors, RCN, built its own fiber optic/coaxial cable networks in several large U.S. cities, offering a combination of video, voice, and high-speed (broadband) Internet access. Ferguson reports on RCN's disastrous financial performance (pp. 164-65), but he does not look deeper into the reasons for its difficulties. By the end of 2003, RCN had attracted

275,000 telephone connections, 411,000 cable television connections, but only 198,000 high-speed Internet connections among its 437,000 subscribers to its network services.¹⁰ Thus, it is clear that most households subscribe to obtain a more attractive package of video services than those offered by the local cable company, not to get high-speed Internet access.

Economists are beginning to study the determinants of broadband demand. Several papers have found that consumer demand for broadband access is quite price sensitive.¹¹ There is further evidence in a paper by Paul Rappoport and associates in the 2003 AEI-Brookings Joint Center *Broadband* book that the web-use patterns of broadband and narrowband Internet subscribers are remarkably similar in breadth.¹² Until new broadband content is developed, broadband subscription demand may be somewhat suppressed, reducing the incentives for network operators to invest in new higher-speed facilities. But content will not be produced unless there are subscribers. An obvious solution to this “chicken-and-egg” problem is vertical integration, a solution very much at odds with the end-to-end, vertical separation policies advocated by Ferguson and other high-tech observers.

7. Government, More Government

Ferguson ends this book with 13 separate policy prescriptions, most of which involve more government intervention. One of these prescriptions is for temporary subsidies to finance network infrastructure, much like the “temporary” subsidies paid to rural telephone companies in the 1930s that continue to this day. All the king’s (or the Senate’s) horses cannot rid of us these enormous continuing distortions that now insure the continuation of unproductive telephone regulation; do we really need a new set of such “temporary” distortions for a rapidly-growing new telecom service? Your and my telephone bill today is riddled with a variety of taxes to fund subsidies for rural health care services, schools, libraries, high-cost telephone companies, and

¹⁰ RCN, *Annual Report to the Securities and Exchange Commission, Form 10K*, March 2004.

¹¹ See, for example, Declaration of Robert W. Crandall and J. Gregory Sidak, Federal Communications Commission, In the Matter of SBC Petition for Expedited Ruling that It Is Non-Dominant in the Provision of Advanced Services and for Forbearance from Dominant Carrier Regulation of Those Services, 2002, and Paul N. Rappoport, Donald J. Kridel, Lester D. Taylor, and Kevin Duffy-Demo, “Residential Demand for Access to the Internet,” University of Arizona Working Paper, Spring 2001.

¹² Paul Rappoport, Donald J. Kridel, and Lester D. Taylor, “The Demand for Broadband: Access, Content, and the Value of Time, in Robert W. Crandall and James H. Alleman, *Broadband: Should We Regulate High-Speed Access?* AEI-Brookings Joint Center for Regulatory Studies, 2003, Ch. 4.

moderate to low-income telephone subscribers. These taxes (including excessive carrier access charges) raise about \$20 billion per year, but they cost at least another \$14 billion or so in lost output because industry-specific taxes are much more distorting than general income or consumption taxes.¹³

If the government were to subsidize investments in the infrastructure required to deliver high-speed Internet services, which technologies would it subsidize? Would it pay wireless carriers to accelerate the roll-out of Third Generation networks? Would this subsidy go only to those using the U.S. CDMA standard or would it extend to companies using the European variant of the standard? Would subsidies be paid for extending fiber optics all the way to the subscriber, or just to the curb? How about a subsidy for the fixed-wireless technologies that AT&T, Winstar, and XO have tried unsuccessfully to develop? Would satellites also be eligible for subsidies, even though their geostationary locations limit their ability to participate in markets that require instantaneous, real-time response rates? If ever there was a risk of the government picking losers, this surely is it. In the wake of enormous mistakes made by many of the world's private and government-owned telecommunications companies in fiber optics networks and spectrum licenses, one would expect students of the telecom industry to be cautious in suggesting that governments subsidize major new investment projects in this area. It was not that long ago that the Japanese government jump-started the satellite video revolution by funding a large investment in an analogue satellite system that was obsolete almost as soon as it reached its final orbit. The French government's large investment in Minitel surely did not contribute to France's participation in the Internet revolution; it is far behind the U.S. today in Internet and broadband penetration.

Ferguson is skeptical that deregulation of telecom is the answer. He notes that despite the FCC's partial deregulation of broadband last year, the Bell companies have not stepped up their capital investment. Surely, one would not expect the financial and engineering staffs of the Bell companies to be so adroit that they could respond in a few weeks to changed regulatory rules with large outlays on network facilities. Actually, the last two quarters of financial reports from these companies show a mild resuscitation of capital spending, but it is surely premature to attribute this up-tick to last year's changes in regulation. It is much clearer, however, that

¹³ Jerry Hausman has documented this cost in a series of articles. See, for example, "Taxation by Telecommunications Regulation," *Tax Policy and The Economy*, Vol. 12, pp. 22-48.

financial analysts now expect the Bell companies to close their 1:2 gap in broadband subscriptions relative to the less regulated cable companies. Surely, this is because the regulatory environment has changed.

The most potentially damaging of Ferguson's policy proposals involve the creation of some quasi-governmental body to specify an "open architecture, competitive local broadband system." This body will dictate the "critical technical interfaces and infrastructure access points" of this system. If the telephone and cable television companies balk at this imposition of dictates on how they build their networks, Ferguson would call on the Justice Department to use the antitrust laws to obtain "structural divestitures."

Surely, no telephone company or cable system would allow its billions of dollars in network investment to be directed in the fashion that Ferguson wants. Capital spending would contract massively. Then, the Justice Department would be called upon to do its magic under the Sherman Act. Fortunately, this policy prescription would become irrelevant because the cable companies and the telephone companies would undoubtedly be able to obtain a dismissal of any case brought against them on summary judgment. One cannot be found to have monopolized a market under Section 2 of the Sherman Act when one does not have a monopoly.¹⁴

Before we try to solve the broadband "problem," I suggest that we first try to understand whether there is a problem and what its origins and dimensions are. Serious policy recommendations should only be based on serious analytical research. If the problem is insufficient investment, then we should remove obstacles to capital spending by the cable television and telephone companies. The FCC did precisely this when, last year, it decided not to require the telephone companies to share their lines with entrants at low, regulated rates. The FCC has also tried to leave cable modem services unregulated. These deregulatory approaches are likely to increase capital spending. Attempting to dictate these companies' network

¹⁴ The use Section 2 of the Sherman Act to break up alleged monopolies has not worked very well anyway. For a review of the effects of Section 2 and the antitrust laws in general, see Robert W. Crandall, "The Failure of Structural Remedies in Sherman Act Monopolization Cases," *Oregon Law Review*, Vol. 80, No. 1, Spring 2001, pp. 109-198; and Robert W. Crandall and Clifford Winston, "Does Antitrust Policy Improve Consumer Welfare? Assessing the Evidence," *Journal of Economic Perspectives*, Fall 2003, pp. 3-26. See also, Robert W. Crandall, "Costly Exercises in Futility: Breaking Up Firms to Increase Competition," AEI-Brookings Joint Center for Regulatory Studies, December 2003, available at <http://www.aei-brookings.org/about/advisorybio.php?id=2>.

architecture, require open access to their facilities, or even to break them up is surely not likely to be conducive to increased capital spending.