

Investment in Cable Broadband Infrastructure: Open Access is Not an Obstacle

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EXECUTIVE SUMMARY

“The Canadian Cable Television Association is committed to the implementation of third party access, in large part because it is in the cable companies’ financial interests.”
Reply comments of the Canadian Cable Television Association in PN 98-14, 10/30/98,
p. 2 (<http://www.crtc.gc.ca/internet/1998/8697/c12/02/ccta/981030fc.doc>).

The cable television industry in the United States has stated that its overarching goal is to transform from traditional multichannel video program providers to full service telecommunications providers, able to offer to consumers a full range of services, including video, local and long distance telephony, and high-speed Internet access services. AT&T is the exemplar: it has embarked on a massive program to deliver a bundle of telecommunications and advanced information services to U.S. residences. In the past year, AT&T has catapulted to become the nation’s largest cable operator through its acquisition of TCI and its proposed acquisition of Media One. Moreover, through a series of joint ventures with most of the other large cable providers, AT&T is positioned to deliver local phone service over cable to a substantial portion of the homes passed by cable in the U.S.

The cable industry generally, and AT&T specifically, has asserted that if cable operators are not allowed to maintain exclusive control over which Internet Service Providers (ISPs) their customers can use over the broadband cable infrastructure, they will not make the infrastructure investments necessary to make cable broadband Internet services widely available. Simply put, AT&T claims that unless its own vertically-affiliated ISP is the exclusive choice for Internet access, its cable upgrades will not be profitable, and will be too risky to justify the large investments needed.

It is important to understand that there are two separate services at issue, sold in two separate markets. One service is broadband last-mile transport, or the carriage of digital data between end users and ISPs. The second service is Internet service provision, which includes not only access to the Internet, but a value-added set of services such as content, chat, e-commerce and other features and functionality.

Open access will not reduce the value of broadband last-mile transport infrastructure.
Incumbent cable operators will have substantial market power over broadband last-mile transport, and thus last-mile transport *investments will be profitable* even with open access. Cable operators will retain their market power because most will face at most one competitor, the incumbent local phone company selling DSL broadband service. Open, non-discriminatory access would not create any alternative suppliers of broadband last-mile transport, so cable operators’ market power would be undiminished. While some cable operators’ vertically-affiliated ISPs may lose market share under open access, cable operators could charge the same price for transport to competitive ISPs as they charge to their affiliated ISP. Control over the price of transport provided to ISPs by the cable operator ensures profitability.

Open access will reduce the risk that cable broadband transport will be unprofitable.
Open access would increase the variety and quality of ISP services, making cable

delivered Internet service appeal to *more* customers, increasing cable operator revenue and thereby reducing risk.

Investments in broadband facilities will be so profitable that even under extremely conservative assumptions ("worst case" for cable operators such as AT&T), ample incentive exists for cable system upgrades. Specifically, this paper demonstrates that, even with zero revenue from a vertically-affiliated ISP (an extreme and unrealistic assumption):

- Investing in the infrastructure to provide local phone service and cable broadband Internet access yields more than a 60% higher return than does merely operating the cable companies as video distribution services; and
- If cable companies such as AT&T were to make the necessary investment to support local telephony – which is its often-stated plan – then making the incremental investment necessary for broadband Internet services would yield more than a 250% higher return than would cable TV alone.

That is, AT&T and others will earn nearly three times as much profit per dollar of additional investment from adding open access broadband transport to the planned cable TV / local telephony network bundle, as they will earn on the cable TV investments already made. This is a rare, extraordinarily valuable opportunity.

It may be that, as AT&T claims, it will earn even higher profits if permitted to monopolize Internet service over its broadband cable. However, more profit than the already extraordinary profit available from open-access broadband may make AT&T shareholders happy, but is clearly not a justification for reducing competition or for reducing broadband investments.

The evidence already shows that investment in broadband facilities is strong when open access is required. In the U.S., telephone companies are investing in DSL facilities, despite the requirement that they provide open access. And in Canada, where the requirement to provide open, non-discriminatory access was announced in January 1996, the major cable operators are investing in broadband facilities faster than the major U.S. cable operators.

Cable company statements that they will not invest in broadband last-mile facilities are not credible. The cable companies may *claim* they won't invest, but carrying out this threat would be irrational and contrary to their shareholders' interests.

Indeed, careful economic analysis shows that open access may increase last-mile broadband transport profits for cable operators such as AT&T. Cable companies would be able to charge the same price to competitive ISPs for broadband last-mile transport as they could have charged their vertically-affiliated ISP, and in addition, *the number of residential subscribers would likely be greater.*

Open access would foster increased residential subscriptions to cable modem service in three ways: (i) competition among ISPs would encourage them to offer *higher quality, lower-priced service* than an exclusive vertically-affiliated ISP would provide, and

consumer demand for cable modem service would be stimulated by the low prices and high quality; (ii) *existing ISPs would help migrate their current dial-up customers* to faster cable modem service; and (iii) there would be *much more variety* in ISP services available with cable modem service under open access, which would attract a broader segment of the market for broadband services.

Other independent analysts, such as Merrill Lynch, agree that open access would be successful for cable operators. Indeed, even the organization that represents Canadian cable operators agrees that open access is in their financial interest.

In summary, under open access:

1. Broadband service profits will be *more than sufficient* to induce rapid investment.
2. Cable broadband transport *profits will be higher*.
3. *Consumers will benefit tremendously* from the greater quality and variety of ISP service. This will increase penetration rates, and we will reach the Nation's goal of widespread broadband information infrastructure more quickly.

1. Introduction

This paper examines the effect of an open access requirement on the incentives of cable operators to invest in the facilities necessary to offer advanced communications services over their cable systems. I present two separate, in-depth analyses. The first analysis, in Section 2, shows that under open access the expected return on investment will be more than sufficient to support aggressive broadband upgrades, and that the investment risk will decrease. The second analysis, in Section 3, shows that open access may actually increase cable companies' profits. Penetration rates for cable modem service would be higher under open access conditions because competition among ISPs would bring about more variety, higher quality, and lower-priced ISP services on the cable network. Higher penetration will lead to increased broadband transport revenue and a broader set of revenue sources for cable operators, reducing the risk of investing in network upgrades in order to offer cable modem service.

2. Non-Discriminatory Open Access Will Not Diminish Investment

2.1. Overview

Cable operators say they will not invest, or will invest more slowly in the facilities necessary to provide broadband last-mile transport services if they are required to provide non-discriminatory access to unaffiliated ISPs.¹ In the first half of this paper, I evaluate that claim by examining the incentives for cable companies generally, and for AT&T in particular, to invest in broadband last-mile transport facilities.

¹ “[AT&T] has said that if federal regulators require the company to open up their cable networks, AT&T would pull back from the investments needed to modernize the cable infrastructure.” (“AT&T: The house that Armstrong rebuilt,” CNET News.com, 4/22/99, <http://www.news.com/News/Item/0,4,35561,00.html>). The FCC summarizes AT&T's arguments in the TCI merger proceeding: “According to AT&T-TCI, any equal access conditions such as those advocated by opponents to the requested transfers will impose substantial investment costs and expenses on @Home, which will only delay and diminish its deployment of broadband services to residential customers... Moreover, argue AT&T-TCI, the advertising revenues provided by @Home's content are needed to offset the transmission costs incurred by providing cable modem service. (“Memorandum Opinion and Order In the Matter of Applications for Consent to the Transfer of Control of Licenses and Section 214 Authorization from Tele-Communications, Inc., to AT&T Corp.,” FCC 99-24, Federal Communications Commission, February 17, 1999, ¶89, p. 41)

2.1.1. The Payoffs

There are two distinct payoffs from investing in broadband last-mile transport facilities. It is important to distinguish between them. The first payoff, which I call “broadband last-mile transport revenue,” is payment from ISPs to the cable operators for the use of the last-mile facilities. The payment will generally be a fee for each broadband subscriber an ISP serves over the cable companies’ facilities.² The second payoff, “ISP income,” is revenue earned by cable operators through their ownership of vertically-affiliated ISPs.³ For example, AT&T receives income and capital appreciation from its ownership share in the vertically-affiliated ISP, Excite@Home.⁴

Open access would increase cable companies’ broadband last-mile transport revenue, but may reduce their ISP income because of increased ISP competition.⁵ Open access affects the payoffs differently because they are earned in different markets.⁶ The first payoff is earned by cable companies in the broadband last-mile transport market. In this market, the cable companies sell ISPs broadband access to consumers. That is, the cable operator is selling digital communications links. In most areas, there are two or fewer firms sharing the broadband last-mile transport market: the incumbent cable operator and the incumbent local phone company.⁷ In general, ubiquitous and affordable alternative broadband last-mile networks for residential consumers are not available.⁸

² In practice, cable companies will either bill subscribers and forward a portion of each subscription fee to the ISP or ISPs will bill subscribers and remit a portion of that revenue to cable companies. In either case, ISPs are paying cable companies for last-mile transport. It may simplify things to think of cable companies as “upstream” firms, supplying an input, broadband last-mile transport, to ISPs, the “downstream” firms. ISPs use the input to supply broadband Internet access services to consumers. (See Appendix A).

³ A “vertically-affiliated ISP” is an ISP which, like Excite@Home, provides Internet service on a cable company’s facilities, and is owned in part by the cable company. Due to its ownership interest, part of the vertically-affiliated ISP’s net income flows to the cable company.

⁴ If the merger between AT&T and MediaOne goes through, AT&T will also get a payoff from its ownership share in the RoadRunner ISP.

⁵ See Section 3.2.4 for an explanation of how open access increases broadband last-mile transport revenue.

⁶ See Appendix A for formal market definitions and a chart that illustrates the markets and flow of funds.

⁷ The broadband technology being deployed by phone companies is known as Digital Subscriber Line, or DSL.

⁸ I discuss market power in Appendix A. I show that alternatives to the incumbent cable company and incumbent local phone company for broadband last-mile transport will not be generally available within the next few years.

Cable companies have a head start over local phone companies, and thus the cable companies have substantial market power. In an open access environment, the cable companies will provide last-mile transport to some combination of independent and vertically-affiliated ISPs and will collect revenue from them both. Even if open access shifts some ISP market share to independent ISPs, the cable company will still collect the broadband transport revenue. Indeed, as I show in Section 3, *broadband transport revenues are likely to increase*.

The second payoff, ISP income, is earned in the retail market for broadband Internet services. In this market, ISPs such as Excite@Home, Mindspring, AOL and countless others compete to sell broadband Internet access service to consumers. With exclusive access, there is only one ISP on each local cable broadband network: the incumbent local cable company's vertically-affiliated ISP. The cable operator may also profit through its ownership interest in the affiliated ISP. With open access, the vertically-affiliated ISP might lose market share, and earn less profit to share with its affiliated cable company. Cable companies say this decrease in vertically-affiliated ISP income will deter investment in broadband last-mile facilities.

Investment in broadband last-mile facilities would increase revenues and profits from both markets (last-mile transport and ISP service). Cable operators claim that even higher ISP income from exclusive access (which is to say, an affiliated ISP monopoly on broadband last mile cable links) is necessary to support broadband investment. As I show below, the revenues from broadband transport alone are more than sufficient to support aggressive investment, even if ISP income is zero. Indeed, open access may increase customer penetration so much that overall cable operator profits will be *higher*, not lower.

2.1.2. Framework for Analysis

Cable companies will invest in additional broadband last-mile transport facilities if the risk-adjusted expected return from the investment is positive and significant. I begin, in Section 2.3, by showing that open access will not increase the risk of investment in broadband last-mile transport facilities. The analysis then focuses on expected return.

I take a conservative approach to the analysis, giving the benefit of the doubt to the pessimistic cable operator views. I test whether investment in broadband last-mile facilities would be justified by broadband last-mile transport revenue alone. In effect, I assume that cable companies would earn *no* income from vertically-affiliated ISPs. I call assumptions such as this one “conservative” because they make broadband last-mile facilities appear in the analysis to be a worse investment than they actually are.⁹ This gives confidence in the results of the analysis, because we know they do not depend on overly optimistic assumptions. It is, of course, overly pessimistic to assume that vertically-affiliated ISPs’ income will drop to zero.¹⁰

Assuming that ISP income is zero creates a powerful test of whether open access would prevent cable companies from investing in broadband last-mile facilities. If investment is warranted even under the worst-case assumption that ISP income is zero, then contrary to the claims of cable companies, *no* decreases in ISP income resulting from an open access requirement could be great enough to deter investment in broadband last-mile cable facilities. I perform the quantitative test in Section 2.4, and conclude that broadband last-mile transport revenue alone provides more than sufficient incentive for cable companies to invest in broadband last-mile facilities.

The second payoff is income from vertically-affiliated ISPs. Affiliated ISPs might do better if they are protected from competition by having an exclusive access monopoly. Even so, under open access the cable operators will earn *more* from their ISPs by expanding the broadband network than by refusing to invest. By investing to reach more homes, the ISPs will get more subscribers and earn more revenue. Broadband investment under open access increases the cable operators' returns on the value of their equity in

⁹ I make conservative assumptions for a number of reasons. The most important reason is that I can feel confident about the result because I know it doesn’t depend on overly optimistic assumptions. Other reasons are simplicity, and the difficulty of finding, evaluating, and incorporating projections of a large number of variables, and evaluating the effect of all of the projections on the results of the analysis. At virtually every turn in the analysis requiring an assumption, I made a conservative one. The conservative assumptions discussed here are only the beginning; a list of them may be found at the end of Appendix B.

¹⁰ Evidence that vertically-affiliated ISPs would have a bright future even in an open access environment is given in Section 2.4.8.

affiliated ISPs. Since AT&T already owns a controlling share in Excite@Home (and soon is likely to in RoadRunner), it will be reluctant to let that investment lie fallow.

2.2. A Great Deal Of Broadband Investment Has Already Been Made

A great deal of investment in cable broadband facilities has already been made, and this sunk investment would not be affected by an open access requirement. Cable operators have been upgrading to fiber for a number of years. In 1997, cable operators installed more fiber than the massive regional phone operators (the RBOCs) did.¹¹ The FCC reported the status of cable system upgrades in their fifth report on competition in video markets:

¹¹ *1998 MultiMedia Telecommunications Market Review and Forecast*, Telecommunications Industry Association/MultiMedia Telecommunications Association, 1998, p. 46.

Cable System Upgrades by 1998

	% of systems with transmission facilities at 750 MHz or higher	% of systems two-way activated
Comcast	60%	60%
Cox	56%	50%
Cablevision	43%	70%
MediaOne	45%	49%
Adelphia	30%	21%
TCI	20%	26%
Time Warner	n.a.	85% (in 1999)*

Source: *Annual Assessment of the Status of Competition in Markets for the Delivery of Video Programming*, CS Docket No. 98-102, Federal Communications Commission, 12/17/98, p. 25.

Note: The cable companies in the table serve over 61% of cable subscribers in the U.S. (*Ibid.*, Table C-3).

*The source for this table does not give 1998 data for Time Warner. This figure is from "AT&T: Going Local via Cable," *Wired News*, 2/1/99, <http://www.wired.com/news/news/business/story/17644.html>

Moreover, investment is occurring so rapidly that these data are out of date. The number of cable homes passed by Excite@Home increased 50 percent, from 10 million to 15 million, in the six months between September 30, 1998 and March 31, 1999.¹² Recent reports indicate that half of the entire country's cable systems have been upgraded to a standard high enough to offer broadband Internet access.¹³ The upgrade of AT&T's holdings in TCI is expected to be 60% complete by the end of 1999 and 90% complete by the end of 2000.¹⁴ MediaOne expects its 70% of its systems to be upgraded to 750 MHz

¹² @Home reported 10.0 million homes passed on 9/30/98 ("@Home Network Reports Fourth Quarter and 1998 Results Subscriber Base Grows to 331,000 @Home Revenue Increased 546% During 1998," Excite@Home press release, 1/20/99, 1999, http://www.home.net/news/pr_990120_01.html) and 15.0 million 3/31/99 ("@Home Network Reports First Quarter Results," Excite@Home press release, April 13, 1999, http://www.home.net/news/pr_990413_01.html).

¹³ See "The Battle for the Last-mile," *The Economist*, May 1, 1999.

¹⁴ *Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996*, CC Docket No. 98-146, Federal Communications Commission, 1/28/99, p. 18.

with two-way activation by the end of 1999.¹⁵ By the end of 1999, the five largest cable companies, which pass about three-quarters of the households in the U.S., will be able to offer broadband service to 65% of households in their service areas.¹⁶ Road Runner says that by the year 2000, its service will be available to all of the 27 million homes passed by Time Warner and MediaOne, as well as homes passed by other affiliated companies.¹⁷ These data indicate that cable companies' broadband facilities have already been deployed in many areas and are therefore not at risk to any effect of an open access requirement. Moreover, as I show next, an open access requirement would not deter continued investment in broadband last-mile facilities.

2.3. Open Access Reduces Cable Companies' Risk

Investments are evaluated by comparing the incremental revenue from the investment with the incremental cost of the investment, taking into consideration the risk of the investment.

Opponents of open access to cable networks argue that such a requirement will increase the risk of cable's investment in broadband facilities.¹⁸ The rationale for this argument is that unless cable operators bundle the services of their vertically-affiliated ISPs with broadband last-mile transport, broadband services are less likely to catch on with the public because other ISPs have less interest in developing and marketing content "designed to take advantage of the high speeds that cable transmission can offer."¹⁹ Absent this exclusive arrangement, they ask, how could cable operators "justify investing the millions of dollars required to upgrade its systems so as to offer broadband local

¹⁵ See "Media One Group," Merrill Lynch Capital Markets report, April 30, 1999. AT&T's acquisition of MediaOne has not yet been approved.

¹⁶ "Broadband Today," Deborah A. Lathen, Bureau Chief, Cable Services Bureau, FCC, October, 1999, p. 26.

¹⁷ *Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996*, CC Docket No. 98-146, Federal Communications Commission, 1/28/99, p. 31.

¹⁸ "Without integration and accompanying *exclusivity*, risk may increase... leading to a reduction in the willingness to invest" (Ex Parte Written Submission of the National Cable Television Association, "Cable Modems, Access and Investment Incentives," by B. M. Owen and G. L. Rosston, CS Docket No. 98-178, filed Dec. 10, 1998, pp. 2-3) (emphasis supplied).

¹⁹ *Ibid.*, p. 6.

transmission services with no assurance that the Internet access and content industries will offer the specific products and marketing services that might make such a venture profitable?”²⁰

Backing a service provider that is committed to providing broadband specific content may reduce the risk of broadband investment. However, preventing customers from being able to reach *other* ISPs if they so choose does *not* reduce the investment risk. My analysis (see Section 3 below) shows that there would be *less* risk of consumer dissatisfaction and apathy if there is open access. If only one ISP is available and it is unsuccessful in marketing its services to the public, the cable operator will lose transport revenues. In contrast, if many ISPs are available and the public does not like the service offered by the vertically-affiliated ISP, consumers can use a different ISP on the same network. In that event, the cable operator will still be able to charge the competing ISP for network transport. As demonstrated below, broadband last-mile transport fees alone are enough to justify investment in broadband facilities.

There is another fallacy in the claim that a single, exclusive ISP will reduce risk because otherwise there may not be sufficient broadband content to attract broadband customers. Most content on the Internet is developed completely independently of the service provider. Moreover, a vast amount of content that is best suited to broadband is already widely available: music files, videos, Web-based TV programs, videoconferencing, and other high-bandwidth applications are well-developed and universally available, independent of the customer's ISP. The cable industry argument ignores the realities of Internet content development and availability.

2.4. Quantitative Investment Analysis

In this section, I show that there is more than sufficient incentive for cable companies to invest in broadband last-mile facilities, in the worst possible case: that open access causes income from vertically-affiliated ISPs to drop to zero.

²⁰ *Ibid.*

2.4.1. Services Produced Jointly By Upgraded Facilities

One of the reasons cable operators are upgrading their facilities so rapidly is the multiplicity of non-Internet services that can be offered over them. Upgraded cable plant can be used to supply digital TV, telephony, fax service and video-conferencing, as well as Internet access service.²¹ Moreover, digital facilities allow cable companies to increase channel capacity for traditional video offerings and improve reception quality.²² Many of these services, of course, are produced jointly; that is, the investment necessary to deliver several services is shared. This is great news for cable companies, but complicates the analysis of broadband Internet access, because joint investment will support multiple revenue-generating services other than Internet services. In my investment analysis, I conservatively account only for revenues from analog cable TV, telephony, and broadband Internet access. This is conservative because adding revenues from other services would make the investment appear even more attractive.

Indeed, there is substantial evidence that broadband last-mile facilities will produce revenue from fax, videoconferencing, and digital cable TV services, and will provide increased channel capacity and better reception. Comcast and TCI, in submissions to the FCC, specifically mentioned increased video channel capacity as one of the reasons for their recent cable system upgrades.²³ AT&T announced that it is accelerating TCI's upgrade in part to increase video capacity.²⁴ TCI believes that digital video is a widely appealing product that will achieve high penetration among its customers, and has thus made virtually all of its headends capable of delivering digitally compressed tiers. Cox,

²¹ *Annual Assessment of the Status of Competition in Markets for the Delivery of Video Programming*, CS Docket No. 98-102, Federal Communications Commission, 12/17/98, p. 13.

²² "[S]ome operators have chosen to increase channel capacity through the deployment of digital platforms. Through upgrades and rebuilds,... operators can increase the bandwidth of their networks, thus enabling them to offer additional channels of video service, as well as other services (i.e. Internet access, telephony) Through digital compression techniques,... operators can have the option offering their customers more video channels or a higher quality of resolution and reception." (*Annual Assessment of the Status of Competition in Markets for the Delivery of Video Programming*, CS Docket No. 98-102, Federal Communications Commission, 12/17/98, p. 11).

²³ See *Annual Assessment of the Status of Competition in Markets for the Delivery of Video Programming*, CS Docket No. 98-102, Federal Communications Commission, 12/17/98, p. 25. Together, Comcast and TCI serve about a third of the nation's cable subscribers. (*Ibid.*, Table C-3).

²⁴ See AT&T press release, "AT&T provides financial guidance for 1999," 1/8/99, <http://www.att.com/press/item/0,1193,274,00.html>.

Comcast, Time Warner, and MediaOne are all offering digital video services. Analysts predict that digital penetration for six of the nation's largest MSOs will reach between 25%-50% within the next three years.²⁵ ²⁶ Digital TV service will add about a third to the average cable TV subscribers' bill.²⁷ Clearly, cable companies are not relying solely on *Internet* transport revenues to justify broadband facility investments. Nonetheless, to err on the conservative side, I have not included these several sources of additional revenue in my calculations.

2.4.2. Reasons For Choosing AT&T To Study

The next two sections present a quantitative analysis of AT&T's investment decision. I chose AT&T as the subject of my study for a number of reasons. First, AT&T has often stated publicly that it will not invest, or will invest more slowly, in the facilities necessary to provide broadband Internet access services, if it is required to provide non-discriminatory access to unaffiliated ISPs.²⁸ Second, AT&T is an instructive example because it has announced plans to provide a bundle of advanced services on its new cable systems. Third, AT&T is the most important example, since, with or without the MediaOne merger, it will be the largest cable company.²⁹ In addition, analysts estimate that with its agreements to provide telephony services to the subscribers of other cable

²⁵ See *Annual Assessment of the Status of Competition in Markets for the Delivery of Video Programming*, CS Docket No. 98-102, Federal Communications Commission, 12/17/98, pp. 30-31.

²⁶ See *Annual Assessment of the Status of Competition in Markets for the Delivery of Video Programming*, CS Docket No. 98-102, Federal Communications Commission, 12/17/98, pp. 30-31.

²⁷ Merrill Lynch and Credit Suisse Boston Corporation report that digital cable service generates \$15 and \$16, respectively, for Media One Group. Credit Suisse Boston says that the average Media One Group video subscriber pays \$41 per month (exclusive of digital TV service). See "Media One Group," Merrill Lynch Capital Markets report, April 30, 1999; and "Media One Group," Credit Suisse First Boston Corporation report, 1/7/99. The FCC reports that the in 1998, the average cable subscriber paid \$42 per month. (*Annual Assessment of the Status of Competition in Markets for the Delivery of Video Programming*, CS Docket No. 98-102, Federal Communications Commission, 12/17/98, p. 17)

²⁸ See footnote 1.

²⁹ For cable MSOs' market shares, see *Annual Assessment of the Status of Competition in Markets for the Delivery of Video Programming*, CS Docket No. 98-102, Federal Communications Commission, 12/17/98, Appendix C-5.

companies, AT&T will be able to market cable telephony services to almost two thirds of homes passed by cable, about 60 percent of all households in the U.S.³⁰

It is important to remember that other cable operators could adopt strategies similar to the one described below, by bundling cable TV, broadband Internet transport, and local and long distance phone service, perhaps with an affiliated long distance carrier. Indeed, the bundling of cable TV and broadband Internet transport began several years ago in the US, by most of the major cable operators including TCI, Time Warner, Comcast, MediaOne and Cox. Bundled provision of cable TV and local telephony has been commercially successful elsewhere for several years, for example in the United Kingdom. Thus, while the calculations below are somewhat specific to AT&T's situation, the analysis would be similar for all large cable companies.

2.4.3. Quantitative Investment Analysis Method

The standard method for analyzing investment decisions is the net present value (NPV) method.³¹ The analysis I perform is a simplification of that method; I simplify by making conservative assumptions at every turn. A standard NPV analysis in this case would start by presuming that AT&T would continue to offer cable TV services, and is considering offering advanced services as an increment to cable TV. In my analysis I used the same framework. I assumed that AT&T prefers keeping its cable TV companies to selling them, and tested whether the NPV of offering advanced services is as great as the NPV of keeping its cable companies.³² Under the assumption that keeping the cable companies is

³⁰ "Following the successful conclusion of the UMG merger, Comcast partnership and Time Warner JV, we anticipate that AT&T will have the ability to market cable telephony services to an approximate 62.5M homes passed." (Merrill Lynch analyst's report, "AT&T Gets UMG and (Amazingly) Comcast JV Without Bidding War – Very Positive!," 5/7/99).

³¹ In a net present value analysis, the cost of the investment is subtracted from the net present value of the incremental cash flow from the investment. If the NPV is positive, the investment is worth making. The present value of cash flows is calculated using an appropriate interest rate (or a "discount factor") to adjust for the fact that one dollar in a future year is worth less than a dollar today, because money held today could be invested to yield a dollar plus interest at the future date. (See R. Brealey and S. Myers, Principles of Corporate Finance, 5th ed., NY, McGraw Hill, 1996).

³² This assumption is valid even if AT&T were to assert that without the opportunity to invest in local telephony and broadband Internet transport it would not have purchased its cable companies. That would be a *strategic* decision by AT&T about the lines of business in which it wants to participate, not evidence that the cable companies are not worth maintaining as standalone investments if the other services were not

a positive NPV project, and a simplifying assumption about operating cost,³³ investing in the facilities necessary for advanced services is a positive NPV project (worth investing in) if the revenue per dollar of investment from advanced services is at least as large as the revenue per dollar of investment from cable TV. So, for simplicity and due to data constraints, I compare revenue per dollar of investment from advanced services to revenue per dollar of investment for cable TV service. Under the conservative assumptions I have made, this is equivalent to the NPV method.³⁴

I analyze two investment decisions cable companies face. First, I analyze the decision to invest in facilities necessary to produce both phone, and broadband data transport for Internet access service, together. Second, I analyze the incremental decision to offer broadband Internet services assuming that the decision to provide phone service has already been made. In this second analysis, I balance the incremental payoff to the cable operator from offering broadband Internet access services against the *incremental* investment necessary to provide broadband Internet access given that the facilities necessary to provide telephone services are already committed. The following table below summarizes the inputs to the two analyses:

an option. Both TCI and MediaOne were, and for that matter all of the major cable companies are, viable standalone companies with publicly traded stock. That there is active buying and selling of their shares demonstrates that the financial markets collectively conclude that these companies are viable, positive NPV investments.

³³ Due to the absence of good information about operating costs, I make the simplifying assumption that operating cost per dollar of revenue is the same for advanced services as for the cable operator as a whole, if it offers just cable TV. This is a conservative assumption. The cost of operation as a whole includes overhead, whereas advanced services operating cost, because it is incremental, would incur much less overhead. Details about this assumption may be found in Appendix B.

³⁴ I discuss the relationship between revenue per dollar of investment and NPV in Appendix B, and provide a simple proof that my study is equivalent to an NPV study under the assumptions I have specified.

	Decision 1 phone and broadband together <hr/>	Decision 2 broadband incremental to phone <hr/>
<u>Investment</u>	joint cost incremental phone cost incremental broadband cost	incremental broadband cost
<u>Revenue</u>	phone revenue broadband revenue	broadband revenue

To ensure further that the analysis is conservative, I made the following "worst case" assumptions:

- The income earned by a vertically-affiliated ISP (such as Excite@Home or Road Runner) falls to zero under open access.
- Cable companies get no incremental revenue from cable TV services provided by investments in broadband digital facilities, such as expanded channel capacity, enhanced reception quality, or subscription to advanced cable TV services.
- There is no revenue from other services, such as fax and video conferencing.
- No broadband facilities are yet deployed; both new *and* existing investment must be justified by telephone and broadband Internet transport revenue.
- Open access does not increase transport revenues due to quality and variety improvements.³⁵

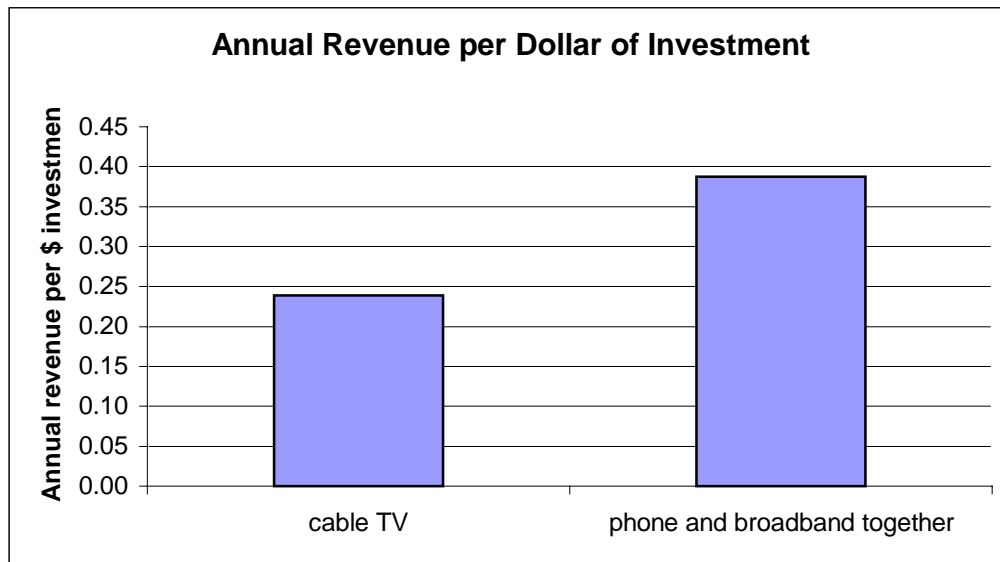
Where differing but plausible estimates of costs or revenues were available, I chose the estimates least favorable for investment. For example, I had estimates of toll revenue per incremental residence customer as high as \$67 for Sprint customers and \$49 for MCI customers (and Sprint and MCI customers are the incremental customers, since AT&T will get no *incremental* revenue from its current customers), yet I used AT&T's own

³⁵ See the next section for a demonstration that broadband last-mile transport revenue would increase under open access.

statement that, for most residence customers, the average toll bill is only \$17. AT&T paid greater than average prices for its cable companies, yet I assume that if AT&T were to sell them, it would get only the average price paid for cable companies.³⁶

2.4.4. Quantitative Investment Analysis Results: Phone and Broadband Together

Despite the several worst-case assumptions, my analysis yields a striking result: investment in cable broadband Internet transport and telephony facilities yields 62% more revenue per dollar of investment than holding cable companies just for TV distribution.³⁷ If holding cable companies just for TV distribution is expected to earn a normal return, then, under the assumptions I have described, investment in the facilities necessary to produce broadband last-mile transport and phone services together is expected to yield a return 62% above the normal rate of return.³⁸ This is more than sufficient incentive for cable companies to invest in broadband last-mile facilities, even under open access.



See Appendix B for details

³⁶ Data sources and selection are discussed in detail in Appendix B.

³⁷ See Appendix B for my analysis.

³⁸ Appendix B contains a brief proof that the ratio of revenue per dollar of investment for two investments is equal to the ratio of their returns, under the assumptions I have described.

Given such a strong result based on such conservative assumptions, there can be little doubt that it is in AT&T's interest to invest in broadband and telephony facilities under open access. If the second payoff, vertically-affiliated ISP income, were included in the analysis, investment would appear even more attractive.

2.4.5. AT&T Will Offer Local Telephone Service

In the analysis above I assumed that AT&T will make the decision to invest in local telephone and broadband Internet facilities *together*. That is, I carried out the analysis as if AT&T would invest in *both* or *neither*. Yet AT&T has made it clear that providing facilities-based local telephony is central to its corporate strategy. Therefore, I now proceed to analyze the *separate* decision to invest in broadband Internet transport assuming that with or without open access, AT&T is committed to going ahead with local telephony investment and services.

There can be little doubt that AT&T intends to offer telephone services over its recently acquired cable plant, whether or not it offers broadband Internet access. AT&T has said repeatedly in the press that it intends to do so.³⁹ AT&T has consistently assured the FCC and other policymakers that it would offer local telephone service when it applied to the FCC for permission to merge with TCI,⁴⁰ and the FCC based its decision to approve the merger in part on AT&T's assurance that it would become a local facilities-based telecommunications competitor.⁴¹ Upon the purchase of TCI, AT&T sent letters to its

³⁹ "“Americans have been waiting for someone to run another wire to their homes to give them a choice in local phone service and deliver the advanced services they expect in a competitive market,” said AT&T Chairman C. Michael Armstrong in a statement announcing the bid. ‘Our earlier acquisition of Tele-Communications Incorporated and now our proposal for MediaOne Group should leave no doubt that we are serious about doing just that,’ Armstrong said.” (“AT&T makes surprise bid for MediaOne,” CNET News.com, 4/23/99, <http://www.news.com/News/Item/0,4,0-35540,00.html?st.ne.ni.rel>). “As a key part of the company’s strategy... AT&T said it is accelerating plans to offer cable telephony services.” (“AT&T provides financial guidance for 1999,” AT&T press release, 1/8/99, <http://www.att.com/press/item/0.1193,274,00.html>). See also “AT&T Widens Local-Service Phone Plans,” *Wall Street Journal*, 1/11/99, p. A3.

⁴⁰ “AT&T currently has concrete plans that appear credible on their face to deploy local exchange and exchange access service in the near term...” (“Memorandum Opinion and Order In the Matter of Applications for Consent to the Transfer of Control of Licenses and Section 214 Authorization from Tele-Communications, Inc., to AT&T Corp.,” Federal Communications Commission, February 17, 1999, p. 62).

⁴¹ “A number of parties representing consumer interests have raised issues concerning AT&T-TCI’s commitment to providing telecommunications services to all Americans on a non-discriminatory basis...

shareholders saying that it intended to “create an advanced broadband network that can deliver an array of communications, entertainment and information services directly to millions of U.S. households.”⁴² Analysts have observed that AT&T is assembling the largest telecommunications network since AT&T divested the regional operating companies.⁴³ AT&T’s chairman says that AT&T wants to own or use cable networks to offer local phone service to 60% to 65% of American households.⁴⁴ The acquisitions and partnerships to achieve that goal have been accomplished – an unprecedented sequence of deals including the purchase of TCI, and the pending acquisition of MediaOne,⁴⁵ and deals to offer cable telephony on cable systems owned by Time Warner, Comcast, Bresnan Communications, Falcon Cable TV, Insight Communications, InterMedia Partners, Peak Cablevision⁴⁶ have given AT&T the ability to offer local phone service to roughly 60% of U.S. households.⁴⁷ Analysts have said that AT&T’s focus is on telephony, rather than the other services it can provide on its cable networks.⁴⁸ AT&T

[Upon review of AT&T’s planned deployment of cable telephony] we are satisfied that AT&T’s current deployment plan does not retard, but in fact furthers, our goal of providing equal and expanded access to advanced telecommunications technologies... We are not persuaded that the merger threatens our universal service goals, and thus decline to condition our approval of the merger on any further assurances from AT&T concerning its deployment plans” (*Ibid.*, pp. 61-62).

⁴² See “AT&T Alters a Key Term in TCI Deal,” *New York Times*, 1/1/99.

⁴³ “What clearly emerges from the blur of billion-dollar dealings is a sense that AT&T is assembling the pieces to create a profile of dominance in the communications landscape unmatched by any company since the old American Telephone and Telegraph broke up under Government pressure in 1984... AT&T has now become the biggest threat to the regional Bells’ dominance in local consumer phone service (“Concerns Raised as AT&T Pursues a New Foothold,” *New York Times*, 5/6/99).

⁴⁴ See *Business Week*, Dec 28, 1998 p53(1) and “FCC gives green light to AT&T-TCI deal,” CNET News.com, 2/17/99, (<http://www.news.com/News/Item/0,4,0-32537,00.html?st.ne.ni.rel>).

⁴⁵ AT&T’s purchase of MediaOne has not yet been approved.

⁴⁶ See “AT&T reaches agreements to form commercial joint ventures with five cable operators,” AT&T news release, 1/8/99, <http://www.att.com/press/item/0.1193,275,00.html>.

⁴⁷ AT&T will be able to market telecommunications to 62.5 million homes passed. (“AT&T Gets UMG and (Amazingly) Comcast JV Without Bidding War – Very Positive!,” Merrill Lynch analyst’s report, 5/7/99). There were 104.1 million households in the U.S. in November 1998 (“Trends in Telephone Service,” Federal Communications Commission, February 1999, Table 17-1, p. 17-3), so AT&T can offer cable telephony to 60% of U.S. households.

⁴⁸ A CNET News article says, “It is also important to remember that the medium AT&T is most focused on right now is the telephone, not the Web. The quickest way for the long distance giant to get back into local phone service is through two-way cable technology. ‘The No. 1 priority of AT&T, exponentially, is local telephony. By the year 2004, AT&T’s local telephone customers, and associated revenue, are expected to outnumber broadband Internet customers by a factor of 4 to 1,’ said Harris of Kinetic Strategies.” (“Battle lines drawn for control of Net,” CNET News.com, 5/10/99, <http://news.cnet.com/news/0-1004-201-342259-1.html?tag=st.ne.1004>).

even sold cable customers to Comcast in exchange for the right to sell AT&T-branded telephone services to Comcast cable subscribers in a joint venture with Comcast.⁴⁹

AT&T has compelling reasons to enter the local phone business. If AT&T doesn't offer telephone services over its cable systems, it is likely to lose further market share in long distance. Companies that offer bundles of communications services may take business away from companies that offer single services. Moreover, AT&T is well aware that at least one of the former Bell Operating Companies (BOCs) is likely to win regulatory approval in the near future to enter AT&T's core long distance business.⁵⁰ Experience in Connecticut with SNET has shown that large numbers of customers will change long distance carriers when they are offered a single package of local and long distance.⁵¹ Thus, offering a bundle of services including local telephone service, broadband Internet access and long distance will help to protect AT&T's long distance service revenues. Indeed, offering bundles of communications services including local voice service as a way of protecting its long distance market has been in AT&T's plans since 1996, well before it acquired cable companies.⁵²

Based on customer surveys and focus groups done last year, AT&T says that two-thirds of all customers and more than 90% of high-volume users want to buy a bundle.⁵³ If AT&T doesn't sell consumers a bundle, someone else will, and AT&T will lose long distance revenues; if AT&T sells the bundle, it will regain some of its lost share of the long distance market. Since Sprint customers spend about 2.5 times what AT&T customers spend on long distance service, and MCI customers outspend AT&T

⁴⁹ See "AT&T and Comcast agree to swap cable systems," AT&T press release, 5/4/99, <http://www.att.com/press/item/0,1193,467,00.html>.

⁵⁰ See "AT&T Has Set Itself Some Tough Challenges," *New York Times*, 4/26/99.

⁵¹ *Id.* The *New York Times* has stated: "Large numbers of Connecticut customers dropped long distance service from AT&T, among others, to take a single package of local and long distance from S.N.E.T. AT&T's strategic planners hate to contemplate the millions of local phone customers who might drop AT&T phone service once Bell Atlantic is freed to offer long-distance service to customers along the Eastern Seaboard, or even just in New York... Mr. Armstrong has decided that the solution is to counterattack the Bells by taking the war to a new front – off the conventional local telephone network and onto cable TV systems. Through those cable lines, AT&T intends to offer local and long-distance calling, as well as Internet service."

⁵² See section 2.4.8, below, for the genesis of AT&T's plans for bundling services.

⁵³ *Forbes*, April 19, 1999 p190(1).

customers about 1.8 times,⁵⁴ AT&T will do well to reclaim customers from Sprint and MCI. Selling local services will also foster a relationship with customers the likes of which AT&T hasn't had since it divested the local operating companies. AT&T would also save on the per-minute access charges paid by long distance carriers by offering local phone service. In short, the benefits to AT&T of offering local telephone service are not limited to the profits to be made from local telephone service; offering local phone service will also make AT&T's long distance service more profitable.

Aside from considerations of AT&T's strategy in phone markets, investment in the facilities necessary to provide phone service is attractive simply because provision of local phone service by cable operators is profitable. The FCC reports that profit margins for local phone service by cable operators are in the range of 40%, and that this level of profit is high enough to encourage further investment.⁵⁵ The assumption that AT&T will offer local phone services, then, is well founded.

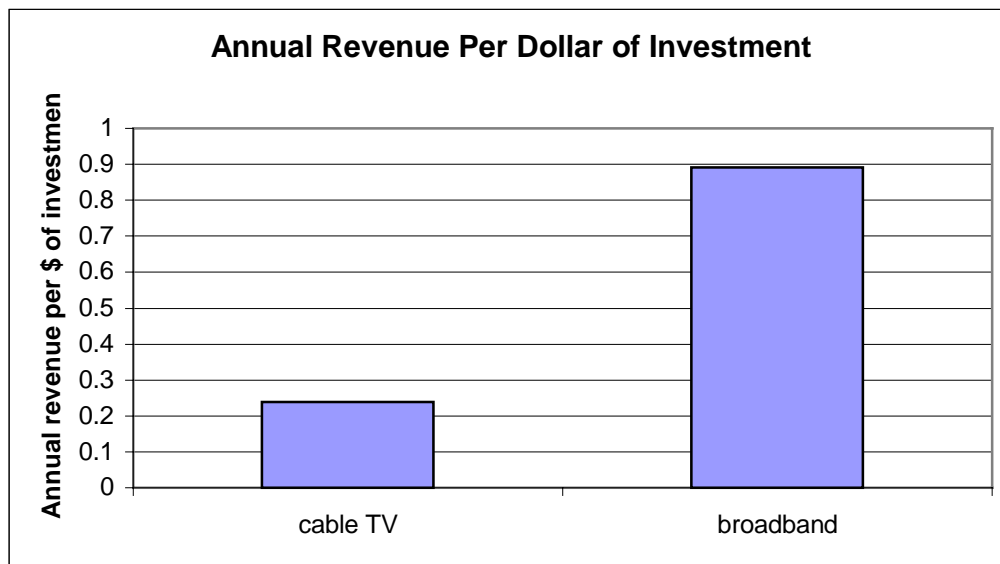
2.4.6. Quantitative Investment Analysis Results: Broadband Given Joint Phone Facilities

I next analyze AT&T's decision to invest in broadband Internet last-mile transport facilities assuming that AT&T has already committed to build local phone facilities, some of which would also support broadband Internet transport. Once we recognize that AT&T will go ahead with local telephony independently of broadband Internet transport, the already strong case for making the necessary incremental broadband Internet investment is much stronger. The reason is simple: the *incremental* investment necessary to provide broadband Internet access is quite small, since the provision of telephone

⁵⁴ See "What me worry?," *Fortune*, September 30, 1996 v134 n6 p121(4)

⁵⁵ "Additional market launches [of local phone service on cable systems] are planned since [penetration] has been ranging 10%-19%, and profit margins for cable telephony are in the range of 40%." (Annual Assessment of the Status of Competition in Markets for the Delivery of *Video Programming*, CS Docket No. 98-102, Federal Communications Commission, 12/17/98, pp. 38-39).

service by itself requires the hybrid fiber-coaxial (HFC) network and two-way activation.⁵⁶



See Appendix B for details

Under open access, the revenue per dollar of investment from broadband last-mile transport facilities, despite my conservative assumptions, is 273% of, or 3.7 times the revenue per dollar of investment from cable services alone. Thus, the return from investment is 3.7 times the normal rate of return.⁵⁷ This is overwhelmingly above the critical level necessary to warrant investment. Foregoing such a lucrative investment opportunity would not make any sense, and would be contrary to the interests of AT&T's shareholders.

2.4.7. Other Estimates Of The Profitability Of Investment In Broadband Facilities

There is substantial agreement that broadband Internet investments by cable companies are very profitable. Jupiter Communications estimates that revenues generated by investments in last-mile broadband Internet transport will pay off their investment in only

⁵⁶ Milo Medin, Chief Technology Officer for @Home, said in a recent interview that "Since data services don't have the same power requirements as voice, we'll be ready for broadband data before voice" (*Wired Magazine*, April 1999, <http://www.wired.com/wired/archive/7.04/medin.html>).

two to three years.⁵⁸ Credit Suisse First Boston Corporation says that “the marginal returns on capital are... many multiples higher than average cable returns today.” It calculates payback periods for wireline telephone service of 2.6 years, 1.4 years for cable modem service.⁵⁹ As mentioned above, the FCC reports that profit margins for local phone service by cable operators are high enough to encourage further investment.

2.4.8. The Bright Side

My analysis of AT&T’s investment decision has thus far employed an extremely conservative, worst case scenario. Under more reasonable assumptions, the case for broadband investment with open access would be even stronger. While I have pointed out the unreasonableness of many of the worst-case assumptions, I have not yet touched on other reasons to believe that investment in local telephone and broadband Internet last-mile facilities will be excellent opportunity for AT&T.

In contrast to the extremely conservative assumptions I have made, the fact is that Excite@Home and Road Runner can be expected to retain significant market share in an open access environment. Both have already established a strong market presence, and there is value for consumers in their networks and content. Thus, AT&T should obtain significant profits from these services even under open access.

While the cost estimate used in my calculations assumed a cable modem penetration rate of 10%,⁶⁰ there is good reason to believe that AT&T will experience higher penetration rates. The cost per subscriber declines as the penetration rate increases, so profitability will be higher with higher penetration rates. The penetration rate for local telephone

⁵⁷ Under the reasonable assumptions explained in Section 2.4.4. See Appendix B for a detailed explanation.

⁵⁸ See “Last-mile Strategies,” Jupiter Communications, August, 1998, (<http://www.jup.com/research/bas/samples/reports/9808/>).

⁵⁹ These estimates exclude the cost of cable system upgrades but include costs of operations. See “Media One Group,” Credit Suisse First Boston Corporation report, 1/7/99. Their estimates are expressed in terms of return on invested capital, ROIC, annual income divided by investment, which is the inverse of the payback period; I present payback periods for convenience of comparison with other estimates.

⁶⁰ See “Last-mile Strategies,” Jupiter Communications, August, 1998, (<http://www.jup.com/research/bas/samples/reports/9808/>).

service experienced by other cable operators ranges from 10% to 20%.⁶¹ AT&T, with its reputation in telecommunications, is likely to experience penetration rates in excess of 20%. In Britain, where cable operators have offered local phone service for about a year longer than in the U.S., the telephony penetration rate for one cable operator, NTL, is 40% in most of its licensed areas.⁶² One of the reasons for NTL's success is that it offers a bundle of communications services.⁶³

As stated, bundling telecommunications services is also AT&T's strategy. AT&T has planned to bundle services since before it acquired cable companies; the strategy was developed years ago to address the fact that AT&T was receiving less revenue per residential customer than were MCI or Sprint.⁶⁴ Through bundling, AT&T seeks to reduce costs and lock in customers, reducing churn.⁶⁵ Analysts agree that bundling will be a successful strategy. AT&T says that its studies show that the majority of consumers, and the vast majority of high volume consumers, say that they would like to buy a bundle of communications services.⁶⁶ Further, the FCC has recognized that:

Multi-service offerings and bundling services for sale seem to enhance subscription to alternative services offered by cable companies... [T]elephony and Internet access through cable modems are becoming high demand services... Indications are that customers value receiving these services through 'one stop shopping.' For example, many large MSOs have found that bundling increases penetration of video and of new services. MSOs, such as Cox, MediaOne, Jones, and Cablevision, indicate that bundling their services increases consumer

⁶¹ *Telephony*; Chicago; Mar 1, 1999; Blair King; Mitch Matteau; Volume: 236 Issue: 9 Start Page: 38. The FCC also reports penetration rates of up to 20% in some areas. See *Annual Assessment of the Status of Competition in Markets for the Delivery of Video Programming*, CS Docket No. 98-102, Federal Communications Commission, 12/17/98, p. 20.

⁶² See "Telecom-to-order," *Forbes*, July 27, 1998, and "The front line: multimedia in Britain", *The Economist*, Oct 26, 1996 v341 n7989 p84(2).

⁶³ "What makes NTL unique is that it already bundles telephone service, cable and Internet access into a single service... NTL's low-cost multichoice strategy is helping it build market share: The company has a 40% penetration rate in most of its licensed areas-almost twice that of any competitor." ("Telecom-to-order," *Forbes*, July 27, 1998).

⁶⁴ "What me worry?," *Fortune*, September 30, 1996 v134 n6 p121(4).

⁶⁵ *Id.*

⁶⁶ AT&T President John Zeglis, basing his statement on recent customer surveys and focus groups, said that two-thirds of all customers and more than 90% of high-volume users want to buy a bundle. (*Forbes*, April 19, 1999 p190(1)). 55% of consumers studied by one analyst said they preferred to purchase communications services from a single company (1998 *MultiMedia Telecommunications Market Review and Forecast*, Telecommunications Industry Association/MultiMedia Telecommunications Association, 1998, p. 39, citing Price Waterhouse/Kenan Systems).

awareness, interest, and ultimately penetration of services while saving on administrative and marketing costs.⁶⁷

Forrester Research says that its studies show that “connectivity bundling will work if packages are built around households’ most expensive services... The key to a successful bundling strategy is the core service – a household’s most expensive connectivity service. In the United States, cable TV (36%) and local telephone (31%) are the leading core services, followed by long distance (23%), cellular phone (7%), satellite TV (5%), and the Internet (1%).” AT&T’s plans are the very model of a successful bundling strategy, as described by Forrester.⁶⁸

In fact, open access would contribute to the success of AT&T’s bundling strategy. As explained in the second half of the paper, there will be more cable modem subscribers if open access is implemented. The more cable modem subscribers there are, the more consumers there will be who will be able to benefit by bundling cable modem service with phone service. Further, since unaffiliated ISPs will not be able to offer cable TV or phone service in addition to ISP service, those customers who want *all* communications services bundled will purchase from AT&T and its affiliated ISPs despite open access: that is, open access does not remove the fully bundled option that AT&T offers.

2.5. Investment Won’t Be Slowed By Open Access

The cable industry has argued that even if broadband investment is still advisable under open access, the pace of investment might be slowed.⁶⁹ However, as a prominent analyst explained:

“There is a race to be first to offer Internet access and ultimately telephone service to the upscale neighborhoods that will buy it first,” said Howard Anderson, president of the Yankee Group, a media consulting firm. “It’s called the ‘first-

⁶⁷ Annual Assessment of the Status of Competition in Markets for the Delivery of Video Programming, CS Docket No. 98-102, Federal Communications Commission, 12/17/98, p. 40.

⁶⁸ See “Forrester’s Technographics® Sees Market Opportunity For Bundled Voice, Internet, And TV Services,” Forrester Research press release, 9/18/98, (<http://www.forrester.com/ER/Press/Releases/Standard/0,1358,17,FF.html>).

⁶⁹ This was one of the major issues discussed during the San Francisco franchise transfer proceeding in the summer of 1999, for example.

mover advantage.’ If customers go with the phone companies, it will be hard, if not impossible to lure them back to cable.”⁷⁰

Consumers’ habits, the cost of learning technology, and the cost of switching equipment, such as trading DSL modems for cable modems, are reasons why customers would be reluctant to switch to cable modem service after having subscribed to DSL.⁷¹ Delaying investment in broadband cable facilities, and thereby losing a substantial share of the market, is not a sensible strategy for cable operators. In fact, as I show in section 2.6, companies in an open access environment are investing very rapidly in broadband last-mile facilities.

2.6. Market Evidence of Investment in Broadband Last-Mile Facilities Under Open Access

Some broadband last-mile carriers currently are subject to open access obligations, and have nonetheless invested vigorously in broadband facilities. Incumbent U.S. local telephone companies are required by law to offer open access, and they are investing in DSL facilities. The BOCs and GTE, for example, have announced plans to offer DSL broadband services to approximately twenty million homes this year, about 20% of the country.⁷² While deployment is slower than the cable companies, DSL has been

⁷⁰ “2 Huge Cable TV Companies to Unite in \$53 Billion Deal,” *New York Times*, 3/23/99.

⁷¹ These effects were discussed in more detail above, in section 2.5.

⁷² *Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996*, CC Docket No. 98-146, Federal Communications Commission, 1/28/99, p. 21-22

hampered by uncertainty about standards.⁷³ With the approval of the DSL-lite standard, investment in DSL is expected to accelerate dramatically.⁷⁴

If economists could perform controlled experiments, they might do something like this: find another country similar to the country of interest, and impose a policy change in the second country but not in the first; study the effect of the change in both countries. As it happens, we have evidence of just that sort from Canada, where the requirement to provide open access was announced in January, 1996.⁷⁵ The major Canadian cable operators are investing quite rapidly, and are ahead of the major U.S. cable operators in broadband facilities deployment. As noted below in Section 3.4, the Canadian Cable Television Association, *the group that represents Canadian cable operators*, is on record as being committed to the implementation of open access because it *believes open access it is in the cable companies' financial interest*.⁷⁶ Four of the five largest cable companies in Canada are affiliated with Excite@Home.⁷⁷ Tom Jermoluk, then Chairman, President and CEO of @Home Network said that, “[d]ue to our partners’ [cable companies’] *strong commitment to advancing two-way network rebuilds*, Canada is a tremendous market for high-speed cable Internet services.”⁷⁸ There were more than two million Canadian

⁷³ “Many regional phone companies have yet to offer the service. It’s currently available in a limited number of markets. Part of the reason for this holdup is that the telcos haven’t agreed on technical standards for ADSL yet. They have the same worries you do about investing in a soon-to-be-orphaned technology, with millions of dollars at stake” (“DSL vs. The World,” *PC Computing*, January, 1998. (<http://www.zdnet.com/products/content/pccg/1101/259442.html>)). The article goes on to describe several varieties of DSL, including CAP, DMT, Rate-adaptive DSL, HDSL, IDSL, SDSL, and VDSL. Forrester Research believes that DSL has been held back by competing technologies and a lack of standards (“High-speed Internet Access To Reach 16 Million U.S. Households By 2002 According to Forrester,” Forrester Research press release, 9/1/98, www.forrester.com/ER/Press/Releases/Standard/0,1358,21,FF.html).

⁷⁴ See “ADSL Will Overtake Cable,” *Wired News*, 12/18/98, <http://www.wired.com/news/news/technology/story/16922.html>, and “High-Speed Access Leaps Hurdle,” *Wired News*, 10/23/98, <http://www.wired.com/news/news/technology/story/15783.html>.

⁷⁵ See Telecom Decision CRTC 96-1, 1/30/96, www.crtc.gc.ca/eng/telecom/decision/1996/d961%5FO.txt.

⁷⁶ See footnote 110.

⁷⁷ See “@Home Network and Videon CableSystems, Inc. Announce Agreement for Delivering High-Speed Cable Internet Services in Canada; Four of the Top Five Canadian Cable Operators Now Affiliated with @Home Network,” Excite@Home press release, 3/18/99, http://www.home.net/news/pr_990318_01.html

⁷⁸ “@Home Network, Rogers CableSystems, and Shaw Communications Announces the Creation of WAVE@HOME,” Excite@Home press release, April 10, 1997 (http://www.home.net/news/pr_970410_01.html). Emphasis supplied.

households passed by broadband Internet transport carriers as early as the end of 1997, in a market with only between 7.5 and 10 million homes passed by cable.⁷⁹

Canada's largest cable operator, Rogers Communications, invested in cable upgrades more rapidly than any of the major U.S. cable operators. *The Wall Street Journal* reports that Rogers invested so rapidly that it "alarmed critics," but Rogers expects that the investments it is making "will mean even higher revenue later, when it will be able to offer a wealth of new products and services, including ... high-speed Internet access."⁸⁰ Currently, 85% of Rogers network is currently capable of providing broadband Internet last-mile transport.⁸¹

Shaw Communications, Canada's third largest cable operator, is not far behind Rogers in investment in broadband technology, and, like Rogers, is ahead of every U.S. cable operator. In a 1998 proceeding before the Canadian commission, Shaw said that it is spending an amount equal to 30% of its gross revenues on upgrading its systems and deploying digital technology.⁸² In 1999, Shaw accelerated its deployment of its broadband network.⁸³ Currently, approximately 70% of its systems are ready to offer broadband Internet last-mile transport, and Shaw expects its systems upgrade to be complete by November, 1999.⁸⁴

⁷⁹ An @Home press release says that "Shaw Communications... is one of Canada's largest cable television operators with approximately 1.5 million homes and serving about 20% of the Canadian market," implying a market size is about 7.5 million homes. It also says "[t]his service will reach approximately five million households, representing more than 50 percent of the Canadian cable television market," implying a market size of almost 10 million households ("@Home Network, Rogers CableSystems, and Shaw Communications Announces the Creation of WAVE@HOME," Excite@Home press release, April 10, 1997, http://www.home.net/news/pr_970410_01.html).

⁸⁰ See "Rogers Communications's (*sic.*) Vision Will Soon Be Tested," *Wall Street Journal*, 7/31/97

⁸¹ [Rogers@Home launches multiple computer access](http://www.rogers.com/rogers/investor/media/index.html), 05/06/99, <http://www.rogers.com/rogers/investor/media/index.html>.

⁸² Shaw Communications, Inc.'s comments in response to Broadcasting Public Notice CRTC 98-82, p. 6. (http://www.crtc.gc.ca/eng/proc_br/notices/1998/pn98-82/col80.doc).

⁸³ "SHAW announces plans to accelerate the deployment of its interactive network to serve all of its customers," 05/14/99, <http://www.shaw.ca>.

⁸⁴ One of my sources implies that Shaw's network is 69% upgraded for broadband Internet access, the other implies 74%. "SHAW announces plans to accelerate the deployment of its interactive network to serve all of its customers," 05/14/99, <http://www.shaw.ca>. says, "SHAW Communications today announced that it is accelerating the deployment of two-way networks in all of its Class I and II cable systems to enable it to offer interactive services such as Shaw@Home high speed Internet and digital services to the remainder of its 1.8 million customers (2.3 million homes passed). This initiative will be completed within six months.

3. Open Access Yields More Broadband Last-mile Transport Revenue

In the first part of this paper, I presented an economic analysis that demonstrates open access will not deter cable companies from investing in broadband last-mile facilities. In the second half of the paper, I show that (contrary to my conservative assumptions in the previous analysis) cable companies would earn *more broadband last-mile transport revenue* in an open access environment than in an exclusive access environment. As explained in Section 2.1.1 above, *ISP income* may be lower in an open access environment. The effect of an open access requirement on cable companies' profitability is the sum of these positive and negative effects. Indeed, Merrill Lynch has stated that AT&T's earnings would benefit if it were to offer access to independent ISPs.⁸⁵

Broadband last-mile transport revenue would increase because open access would increase consumer demand for cable modem service. Since open access would not diminish cable operators' market power over broadband *transport*, they could sell the greater quantities at the same or a higher price. That is, more consumers would be willing to pay the same or higher price and revenues would necessarily increase.⁸⁶

More consumers would subscribe to cable modem service under open access because:

- ISP competition would foster lower prices, improved service quality; and increase innovation;

Over 550,000 customers in the following communities will benefit from this initiative.” This implies that $(1.8-0.55)/1.8 = 69\%$ of customers have access to [Shaw@Home](#). Another source, Campbell, G.D., “Shaw Communications Inc. Canada, Media – Cable Winning at Home,” *Merrill Lynch Capital Markets*, 01/21/99, says that “Shaw continues to lead North America with its At-Home subscribers, which totaled 58,446 at November 30 and 71,126 at December 31 -- a remarkable 6.4% of “homes launched”. This implies that $71,126 / .064 = 1.111$ million homes were passed by [Shaw@Home](#) service. Shaw passes 1.5 million homes (“@Home Network, Rogers CableSystems, and Shaw Communications Announces the Creation of WAVE@HOME,” Excite@Home press release, April 10, 1997, http://www.home.net/news/pr_970410_01.html), so $1.111/1.5 = 74\%$ of homes passed by Shaw cable is also passed by Shaw@Home.

⁸⁵ “We believe that ultimately AT&T and ISPs such as AOL will reach a compromise whereby AT&T agrees to sell cable modem access unbundled from the @Home ISP service to ISPs at a to be determined price... While this would subject AT&T to additional competition, we believe that it would also provide a strong wholesale revenue channel and provide potential future earnings benefits.” (Merrill Lynch analyst’s report, “AT&T Gets UMG and (Amazingly) Comcast JV Without Bidding War – Very Positive!,” 5/7/99)

⁸⁶ See section 2.1 above for a brief discussion of market power in the broadband last-mile transport market. A more detailed discussion of market definition and market power is in Appendix A.

- consumers value variety, so more consumers would subscribe if there were more choice among ISPs;
- ISPs would help migrate their current dial-up narrowband subscribers to cable modem service.

I address each of these in turn.

3.1. The value of competition

The benefits of market competition scarcely need elaboration, so I will be brief. ISPs competing for customers they could reach over the broadband last-mile network would have greater incentive to keep prices low and quality high than if the vertically-affiliated ISP were the exclusive provider.⁸⁷ This would attract subscribers to the cable broadband network, and increase broadband transport revenue.

3.2. The value of variety

3.2.1. Consumers value variety

There can be no doubt that consumers value variety. Consumers have heterogeneous tastes, and a wide variety of products or services will increase both aggregate consumer welfare and demand. The Supreme Court recognizes that restriction of product variety harms consumers:

A refusal to compete with respect to the package of services offered to customers, no less than a refusal to compete with respect to the price term of an agreement, impairs the ability of the market to advance social welfare by ensuring the provision of desired goods and services to consumers at a price approximating the marginal cost of providing them.⁸⁸

⁸⁷ In a proceeding in Canada, where the same issues are being confronted, AT&T Canada Long Distance Services noted the importance of competition to the development of the broadband industry: “If the bottleneck nature of these services [cable broadband last-mile transport] is not recognized, the establishment of a competitive market may be jeopardized, and more significantly, undermine the development of Canada’s Information Highway, contrary to the Federal Government’s stated policy objective to create a network of interconnecting networks.” (AT&T Canada Long Distance Services’ Comments in Response to Telecom Public Notice 96-36, 2/4/97, p. 2 (emphasis supplied) (<http://www.crtc.gc.ca/internet/1997/pn's/pn96-36/at&T/pn9636.doc>)).

⁸⁸ *FTC v. Indiana Federation of Dentists*, 476 U.S. 447 (1986).

Econometric studies have found that the value to consumers of even just one or a few additional choices is substantial, even when they already have many choices.⁸⁹

3.2.2. Variety in ISPs' offerings

In an open access environment, there would be a great deal of variety in ISP offerings on the cable network. There are a large number of firms competing in the ISP industry. Entry and exit are easy. In such a tough competitive environment, product differentiation is an important competitive strategy. ISPs have found myriad ways of making their services stand out among the others. The fact that ISPs offer such a wide variety of services and market themselves to such diverse niches is strong evidence that consumers value variety in ISP offerings.

ISPs differentiate themselves by

- price⁹⁰
- transmission quality⁹¹
- availability and capacity of local access numbers⁹²

⁸⁹ For example,

- One study estimated the value to consumers of a new variety of ready-to-eat cereal, Apple-Cinnamon Cheerios. Despite the existence of similar cereals, such as Honey-Nut Cheerios, and the frequent introduction of other new brands of cereals, the study found that the value of the new brand was substantial. (J. Hausman, "Valuation of New Goods Under Perfect and Imperfect Competition," T. Bresnahan and R. Gordon, eds., *The Economics of New Goods*, University of Chicago Press, 1997)
- A study of the value to consumers of the introduction of the minivan found that the average minivan purchaser was made better off by \$1,772 by being able to buy a minivan. (A. Petrin, 1999, "Quantifying the Benefits of New Products: The Case of the Minivan," manuscript, University of Chicago Business School, available at <http://gsbwww.uchicago.edu/fac/amil.petrin/research/minivan.pdf>, verified 7/1/99)
- Another study of the automobile market found that when a boycott of Israel by most Japanese and Korean car manufacturer was lifted, there was an increase in consumer welfare of \$2,343 per car purchaser, primarily due to increased variety. (C. Fershtman and N. Gandal, "The effect of the Arab boycott on Israel: the automobile market," *RAND Journal of Economics* 29: 193-214 Spring 1998)

⁹⁰ While many ISPs charge about \$20/mo., there are many examples of strong price competition. For example, ZZAPP! offers service including 56Kbps transmission, a personal Web page with 10 megabytes of space, four e-mail boxes, spam filtering, and unlimited file transfer service for only \$12.95/mo. (<http://www.zzapp.org>).

⁹¹ Many ISPs advertise the quality of their facilities and their Internet backbone carrier's facilities. For example, Glinn Network One offers "all digital lines (T1 or better in every POP)", "single hop to the backbone," and "Dual backbone providers for reliable service – we use backbones rated with the best bandwidths by Boardwatch Magazine" (<http://www.gn1.net>). @Home advertises end-to-end networks and special caching arrangements.

- customer service
- form of subscription contract (such as unlimited vs. measured usage)⁹³
- length of service contract⁹⁴
- compatibility with various operating systems
- e-mail offers, like multiple addresses
- Web hosting
- local access lines that offer faster service⁹⁵
- popular software for Internet tasks like file transfer and e-mail, instant messaging, and spam filtering⁹⁶
- training
- service in foreign languages⁹⁷
- affiliations with other Internet firms to provide their subscribers with special services and discounts
- proprietary content

No single ISP can be expected to duplicate the variety found among all the ISPs in the market. Yet without open access, nearly all consumers will have no choice over an ISP for cable modem service. Consumers for whom the services offered by their favorite ISP are more important than any advantages the consumer perceives in cable modem service over other forms of local transport will use other forms of local transport, such as DSL or narrowband services, to the loss of the cable operator.

⁹² Glinn Network One advertises “No busy signals (Limited to 0.7% of all calls attempted)” (<http://www.gn1.net>).

⁹³ For example, Prodigy offers 10 hours of usage for \$9.95/mo, unlimited usage for \$19.95/mo, and, for \$21.95/mo, unlimited usage plus five additional mailboxes.

⁹⁴ Prodigy subscribers who pre-pay for a year save 20% (<http://www.prodigy.com>). Glinn Network One offers service for \$15.95/mo, \$14.95/mo with 3 month prepayment, \$13.95/mo with six month prepayment, and \$12.95/mo with prepayment for a year (<http://www.gn1.net>).

⁹⁵ For example, NetLink Resource Group, Inc. offers access by voice grade phone line, 64Kbps ISDN, 128Kbps ISDN, “burstable” fractional T-1 with committed 256Kbps service and bursts up to 1.54Mbps, and dedicated 1.54Mbps T-1 with committed rate of 512Kbps (<http://www.netlinkrg.com>). Slip.net also has a wide variety of local access lines (<http://www.slip.net>)

⁹⁶ Spam is the junk mail of the Internet. Mindspring advertises “The Spaminator” (<http://www.mindspring.com>). ZZAPP! also offers spam filtering (<http://www.zzapp.org>)

⁹⁷ For example, Azteca.net offers service and support in English, Spanish, Portuguese, and Japanese (<http://www.Azteca.net>).

3.2.3. ISP market niches

Marketing to particular demographic groups or communities is another competitive strategy that produces variety in ISP offerings. In this way, ISPs become cyber communities. Many geographically specialized ISPs, such as Wild Apache Internet Service, offer local content.⁹⁸ Some ISPs are owned and operated by minority groups, such as Native Americans⁹⁹ and gays, like Glinn Network One.¹⁰⁰ ISPs have arisen to serve African Americans (NetNoir), Hispanics (Quepasa.com), Asian Americans (Asian Avenue), and college students (Collegeclub.com).¹⁰¹ Some offer their subscribers specialized links of interest to specific communities, like those interested in promoting Christian and family values,¹⁰² and Catholics.¹⁰³ Others offer specialized services, like filtering of objectionable content.¹⁰⁴

One might ask what value there is in ISPs serving as cyber communities. Don't ordinary Web sites do the same thing? The most straightforward answer is, consumers *like* buying from ISPs that market to their demographic group, and that's all we really need to know. The value they receive from variety is demonstrated by their purchases. We can speculate that some subscribers may like the convenience of having an array of content

⁹⁸ For example, Wild Apache Internet Service (<http://www.wildapache.net>) is a small ISP in Clarksdale, Arizona. It has information about local events, the Verde Valley Library hours, links to local organizations such as the Verde Valley Computer Club, and many American Indian links, such as links to the Web site of the Yavapai-Apache Nation, which is hosted by Wild Apache Internet Service.

⁹⁹ Native Voices International's site (<http://www.nvi.net>) says that it is "the World's first and possibly the only Native American Owned Internet Service Provider... Combining the latest in technology with a deep respect for all of creation, Native Voices International brings a unique perspective to the World Wide Web."

¹⁰⁰ Glinn Network One (<http://www.gn1.net>) advertises itself as "America's gay owned and operated Internet services provider." Glinn Network One offers gay content, links to the gay community, and donates ten percent of its gross revenue to gay and lesbian community organizations.

¹⁰¹ "Affinity Portals Deliver Niche Groups," USA Today, 8/6/99

¹⁰² The Christian Living Network (<http://www.christianliving.net>) is an ISP whose mission is "to strengthen the family unit by providing protection from the lure of pornography and to promote the will of God by providing financial resources to Christian causes." It advertises itself as "the industry leader in offering pornography filtering Internet access," and allows parents to control and monitor their children's Internet use. It donates 10% of gross revenue to the charitable organization of the subscriber's choice.

¹⁰³ Catholic Internet Services (<http://www.roman-catholic.org>) is an ISP that offers links to such Web sites as the Vatican, Catholic World News, Daily Bible Bread, and Cyber Rosary. It donates 100% of its profits to Catholic Charities USA.

¹⁰⁴ Family Connect (<http://www.familyconnect.com>) is an ISP that filters offensive material from the Internet before it is sent to subscribers. For those who already have an ISP they like and don't want to

and links to Web sites that suit their demographic group organized for them by their ISP. Subscribers may like supporting businesses from their own community. The people of the Yavapai-Apache Nation, who use Wild Apache Internet Services from the Verde Valley to host their Web site, may have a strong preference for doing business with the people at Wild Apache right at home in the Valley, rather than some large corporate entity in New York City. Many ISPs make donations to the communities they serve, and subscribers may like their donations targeted to their own community.¹⁰⁵

3.2.4. Variety is profitable for cable companies

Consumers' preference for variety means that open access would increase cable companies' broadband transport profit.¹⁰⁶ ISP variety would boost demand for cable modem service. Open access would not diminish cable companies' market power in the broadband last mile transport market, so they could charge the same or a higher price to more consumers, thereby increasing revenues and profits.¹⁰⁷

3.3. Migration of consumers from narrowband

The greatest immediate pool of potential cable modem users is current Internet users employing a dial-up connection over the last-mile. If competitive ISPs were able to offer service over the broadband cable network, they would encourage their customers to purchase cable modem service. Advertising cable modem services on ISP portals would be highly effective in increasing consumer awareness of cable modem service.

Consumers would be more inclined to purchase cable modem service if they could do so without changing their ISP. With exclusive access, a vertically-affiliated ISP needs to

change, it also offers filtering unbundled from access for \$4.95/mo., a specific measure of the value of this type of variety.

¹⁰⁵ See the footnotes to the previous paragraph for examples of ISPs that target donations to the communities they serve.

¹⁰⁶ One of the econometric studies cited above shows how product variety results in higher firm profit. See A. Petrin, 1999, "Quantifying the Benefits of New Products: The Case of the Minivan," manuscript, University of Chicago Business School, available at <http://gsbwww.uchicago.edu/fac/amil.petrin/research/minivan.pdf>, verified 7/1/99.

¹⁰⁷ See Section 2.1.1 or Appendix A for a discussion of market power. I show that cable companies have substantial market power in the broadband last mile transport market, and that this power is not diminished

convince current Internet users to drop their current ISPs and switch. With open access, the current ISPs themselves become part of the marketing force moving customers towards broadband access.

3.4. Experts believe open access would be profitable for cable operators

The financial advantage of open access for cable operators has been noted both by analysts and cable companies. As mentioned above, Merrill Lynch believes it will be in AT&T's interest to provide access on its network to ISPs, even though doing so would create competition for its vertically-affiliated ISP, because it would "provide a strong wholesale revenue channel and provide potential future earnings benefits."¹⁰⁸ Jupiter communications says that "the cash inflow from reselling cable access might be too lucrative for AT&T to refuse and the company might agree to open up TCI's network."¹⁰⁹

In a proceeding in Canada, the trade organization representing Canadian cable operators, the Canadian Cable Television Association (CCTA) said that, "the CCTA is committed to the implementation of third party access, in large part because it is in the cable companies' financial interests."¹¹⁰ The CCTA went on to explain that open access helps to spread the fixed cost of broadband facilities over a larger customer base because unaffiliated ISPs bring subscribers to the cable network.¹¹¹

AT&T's own experts, Professors Ordoover and Willig, argue that cable operators have a strong financial incentive to offer a variety of content on their network. I will quote at some length from their declaration to the FCC. Although they discuss the advantages to

by open access, because it depends on the number and quality of substitutes for cable broadband last mile transport, and none are created by open access.

¹⁰⁸ See Merrill Lynch analyst's report, "AT&T Gets UMG and (Amazingly) Comcast JV Without Bidding War – Very Positive!," 5/7/99).

¹⁰⁹ "Last-mile Strategies," Jupiter Communications, August, 1998, (<http://www.jup.com/research/bas/samples/reports/9808/>).

¹¹⁰ Reply comments of the Canadian Cable Television Association in PN 98-14, 10/30/98, p. 2 (<http://www.crtc.gc.ca/internet/1998/8697/c12/02/ccta/981030fc.doc>).

¹¹¹ "Customers brought to the cable network by alternate ISPs such as AOL, will help to recover the considerable investment involved in rolling out high-speed access capability and the high proportion of

cable operators of supplying content, their argument works equally well for ISP services. As you read Ordoover's and Willig's argument, every time they say "content," replace that word in your mind with the words "ISP services," and ask yourself whether the argument doesn't work just as well. I think it does. They say,

Our analysis will show that TCI, like all other cable providers, has a strong financial incentive to offer a wide range of internet content to its customer base. This is because the attractiveness of its broadband offering depends not only on the speed with which the customer can receive information from the internet but also on what the customer can get from the internet when it gets there. This gives TCI an ample reason to accommodate any reasonable requests by alternative content providers. If any such provider seeks to offer content that TCI's customers would find attractive, and the provider is willing to pay a compensatory access fee, it will be in TCI's interests voluntarily to come to agreement with the provider.¹¹²

Assume the bottleneck owner bundles its content with its access, and sells the package for some monthly subscription fee. Under this arrangement consumers cannot reach any other content through their subscription to the service. But is such an arrangement profit-maximizing? The answer is likely no, provided that there are some other sources of content that the bottleneck's actual and potential customers would find desirable. Indeed, by excluding the other content, the bottleneck owner diminishes the value of its scarce asset by some dollar amount that reflects the "average" consumer valuation of the available alternative sources of content.¹¹³

Just as consumers value a variety of sources of content, they value variety in ISP services. And if it is not profit-maximizing to exclude sources of content consumers find valuable, as Ordoover and Willig assure us, why would it be profit-maximizing for cable operators to exclude sources of ISP services consumers find valuable? There is a strong possibility that cable company profits, and their incentive to invest in broadband last mile facilities would actually be higher in an open access environment.

high-speed access costs that are expected to be causal to the service as a whole but not causal to units of demand." (*Ibid.*, p. 3)

¹¹² See AT&T's and TCI's Joint Reply to Comments and Joint Opposition to Petitions to Deny or to Impose Conditions, CS Docket No. 98-178, filed Oct. 29, 1998 at "Affidavit of Professors Ordoover and Willig," p. 13.

¹¹³ *Ibid.*, p. 14. Emphasis added.

4. Conclusion

Open access would increase the amount of broadband last-mile transport revenue cable companies receive. This may more than offset the reduction in vertically-affiliated ISP income. If so, open access would be good for cable companies' profitability, and open access would actually increase the incentive to invest in broadband last-mile cable facilities. In any case, even if there is not a net gain, any reduction in vertically-affiliated ISP income resulting from open access would be substantially offset by increased broadband last-mile transport revenue.

Even if an open access requirement were to reduce cable companies' profits, my analysis has shown that the worst-case returns on investment are extremely high, and more than sufficient to justify rapid, widespread investment. Cable operators will retain their market power in broadband last-mile transport, and thus will profit from investments in broadband last-mile facilities. Open access will decrease, not increase the riskiness of this investment. Further, it is in cable companies' interest to invest rapidly to capture market share early. The predictions made by some U.S. cable operators that investment in broadband facilities will be retarded by open non-discriminatory access simply do not make sense.

Appendix A

Market definition and market power

Market definition

There are two product markets relevant to this analysis. Roughly, a product market includes all goods or services that are close substitutes.¹ The first market is the “broadband last-mile transport market.”² In this market, Internet service providers (ISPs), such as @Home and AOL, buy broadband last-mile transport from network providers, such as cable operators and local exchange carriers (LECs). The second market is the “broadband Internet services market,” in which end-users purchase broadband Internet service from ISPs. In a submission to the Canadian regulatory commission, AT&T Canada Long Distance Services reached the same conclusions presented here: last-mile transport and ISP services are in distinct markets, and broadband last-mile transport is in a separate market from narrowband last-mile transport services.³

Follow the money

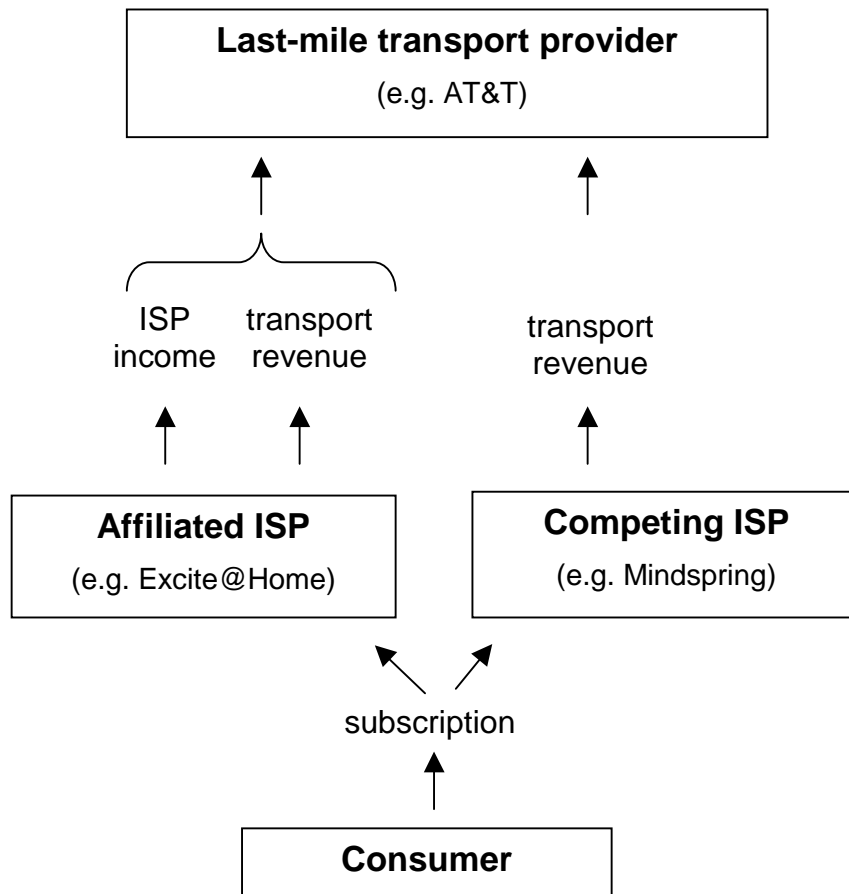
The diagram below illustrates the flow of funds in the broadband industry. It begins with consumers, who pay subscription fees to their ISPs. ISPs also receive revenue from advertising and e-commerce fees (not shown in the diagram). Two types of ISPs are illustrated in the diagram. I refer to ISPs that are owned in part by the cable operator

¹ To be more precise, a product market is the smallest set of services over which a monopolist, if one existed, could exercise market power. (See “Horizontal Merger Guidelines,” U.S. Department of Justice and the Federal Trade Commission, April 2, 1992, Rev. April 8, 1997) Market power is the ability to raise price above the competitive level, lower quality below the competitive level, or impose restrictions on buyers that would not be found in a competitive market. Geographic markets are defined similarly. The geographic market for last-mile transport is local, since, *e.g.*, cable modem service in Brooklyn doesn’t substitute for cable modem service in Peoria.

² The critical issue in defining a product market that includes broadband Internet access is whether narrowband Internet service is a sufficiently good substitute for broadband service to impose restraint on a putative monopolist in broadband services. Narrowband Internet service cannot deliver many of the services broadband access can, such as full motion video, video conferencing, and high quality audio. Moreover, many consumers value broadband service simply for the speed with which they can download web pages. AT&T’s economists argue that the fact that AOL’s sales of narrowband service slowed in areas where cable modem service became available is evidence that narrowband service will put competitive pressure on broadband service. (See AT&T’s and TCI’s Joint Reply to Comments and Joint Opposition to Petitions to Deny or to Impose Conditions, CS Docket No. 98-178, filed Oct. 29, 1998 at “Affidavit of Professors Ordovery and Willig, p. 10”) Sales of slide rules slowed when calculators were introduced, too, but that hardly means that sellers of slide rules could prevent a monopolist in calculators from exercising market power. The author of Forrester Research’s report on broadband Internet access says, “Once consumers get a taste of high-speed Internet access at home, they’ll never go back to dial-up.” (“High-speed Internet Access To Reach 16 Million U.S. Households By 2002 According to Forrester,” Forrester Research press release, 9/1/98, www.forrester.com/ER/Press/Releases/Standard/0,1358,21,FF.html)

³ See AT&T Canada Long Distance Services’ Comments in Response to the Canadian Radio-television and Telecommunications Commission’s Telecom Public Notice 96-36, 2/4/97, pp. 6-7 (<http://www.crtc.gc.ca/internet/1997/pn’s/pn96-36/at&T/pn9636.doc>)

through whom the ISP offers service, such as [Excite@Home](#), as “vertically-affiliated ISPs.” Cable companies, due to their ownership interest, receive a share of the income of their vertically-affiliated ISPs, labeled “ISP income” in the diagram.⁴ ISPs, whether vertically-affiliated or not, pay the last-mile transport provider a fee for each broadband subscriber; this is labeled “transport revenue” on the diagram.



Under open access, some end-users would switch from cable companies’ vertically-affiliated ISP to competing ISPs, reducing the affiliated ISPs’ revenue, and the portion of ISP income received by cable companies. However, this would not reduce cable companies’ transport revenue at all: cable companies would simply collect the same or more transport revenue from competing ISPs rather than from their vertically-affiliated ISP. Cable companies that do not own a share of a vertically-affiliated ISP do not get any ISP income, so their receipts will not be reduced by open access, and hence, neither will their incentive to invest in broadband facilities. The central finding of this paper is that transport revenue *alone* is sufficient to induce cable companies to invest in broadband last mile transport facilities.

⁴ Thirty-six percent of Road Runner’s profits flow to Time Warner, fifty percent go to MediaOne, and forty percent of Excite@Home’s profits go to TCI. The profits of TCI and MediaOne, in turn, including profits from both last-mile transport and their share of Excite@Home and Road Runner, will flow to AT&T, which owns TCI, and will own MediaOne if the merger is approved.

Market power

The economic principle behind this result is market power. Market power allows cable operators to charge prices for broadband last-mile transport that are sufficiently high that last-mile transport revenues alone justify investment. Market power depends on the number and quality of alternatives. When buyers have few or poor alternatives, producers are able to raise price above the competitive level – in other words, exercise market power. In the market for ISP services, there are many producers, and entry and exit are easy, so ISPs, even big ones, have little market power. But as I show below, incumbent cable operators will have substantial power in the market for broadband last-mile transport.⁵

Most analysts predict that cable and digital subscriber line (DSL) will be the dominant technologies in broadband last-mile transport.⁶ Satellite and wireless service will not obtain significant market shares in the next several years, if ever. One analyst predicts that satellite will have only 7% of the broadband subscribers in the U.S. by the year 2004.⁷ But even this small share overstates the extent to which satellite service will provide competitive pressure for DSL and cable broadband providers, since satellite may be relegated to low-density areas that are too expensive to be served by wirelines. For densely populated areas, DSL and cable TV will be more economical.⁸ Moreover, satellite service is a lower quality option, since it requires a phone link for upstream traffic, and phone links are generally narrowband. For this reason, satellite service does not currently meet the FCC's definition of broadband, which requires at least 200 Kbps in both directions.⁹ Even downstream, satellite offers less bandwidth than cable modem service, with advertised rates of 400 Kbps, and sustained bandwidths of about 225Kbps

⁵ AT&T Canada Long Distance Services agrees that cable operators that supply broadband last mile transport “have the ability to exercise significant market power through the control which they exercise over bottleneck broadband access facilities and through the dominance which they enjoy in their ... core business markets.” (AT&T Canada Long Distance Services' Comments in Response to Telecom Public Notice 96-36, 2/4/97, p. i (emphasis supplied) (<http://www.crtc.gc.ca/internet/1997/pn's/pn96-36/at&T/pn9636.doc>))

[Cable operators] are not unlike the incumbent local telephone companies because they too control a bottleneck facility or essential input (i.e., direct access to the end-user) into the services that are provided by other carriers and service providers” (*Ibid.*, p. 1, emphasis supplied)

⁶ “There are only two viable plans for bandwidth freedom in the works: cable and DSL.” (“DSL vs. The World,” *PC Computing*, January, 1998. (<http://www.zdnet.com/products/content/pccg/1101/259442.html>) While analysts disagree about the market shares DSL and cable modem broadband Internet services will have in the future, there is widespread agreement that other technologies will not have significant market shares. See “Beaten to the punch,” *Telephony*, Oct 19, 1998, “ADSL Will Overtake Cable,” *Wired News*, 12/18/98, <http://www.wired.com/news/news/technology/story/16922.html>, and “Cable modems to win consumer market, study says,” *America's Network*, Dec 1, 1998 v102 i23 p26(1) for three articles that discuss only DSL and cable broadband access.

⁷ See “ADSL Will Overtake Cable,” *Wired News*, 12/18/98, <http://www.wired.com/news/news/technology/story/16922.html>.

⁸ See “Broadband satellite will be niche market,” *Satellite International*, 1(14):1, September 09, 1998.

⁹ See *Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996*, CC Docket No. 98-146, Federal Communications Commission, 1/28/99, p. 9.

in practice.¹⁰ Not only is satellite a lower quality option, it is fairly expensive.¹¹ And satellite service is not an option at all for end-users without a clear view of the southern sky.¹² In its "Editor's Choice" column evaluating broadband alternatives, *PC Magazine* stated that satellite service is "a good solution for locations where neither cable nor DSL services have yet arrived."¹³

Wireless technology is still in its early stages, and has yet to overcome some basic problems, such as the effect of weather on transmission quality.¹⁴ Wireless service currently has very limited availability,¹⁵ and is not likely to capture a large share of the market.¹⁶ Wireless customers will be primarily businesses, not residences.¹⁷ The FCC says that "[a]lthough the marketing focus for most fixed wireless companies is currently on small and medium-sized businesses, some may begin offering limited residential service on this spectrum within five years."¹⁸ Since cable service is primarily for residences,¹⁹ wireless broadband will exert very little competitive pressure on the cable companies even in those few areas where it is available.

Not only are cable broadband and DSL the only two *technologies* that will provide economically reasonable substitutes for most consumers, but the incumbent cable operator and the incumbent local phone company (LEC) will be the only two economically reasonable *providers* of these services for most consumers in the near future. In most geographic markets, there is little or no significant competition from cable overbuilders²⁰ or competitive LECs. Even where there is a cable overbuilder, the overbuilder is likely to be a LEC.²¹ And where competitive LECs exist, they are not a meaningful infrastructure competitor because they simply lease lines from the existing

¹⁰ See "Satellite," *PC Computing*, March 31, 1999, (<http://www.zdnet.com/products/stories/reviews/0.4161,394270,00.html>).

¹¹ See "The Battle for the Last-mile," *The Economist*, May 1, 1999.

¹² See "Get Faster Access," *PC Magazine*, March 31, 1999 <http://www.zdnet.com/products/stories/reviews/0.4161,2233480,00.html>.

¹³ See "Editor's Choice," *PC Magazine*, 3/31/99, <http://www.zdnet.com/products/stories/reviews/0.4161,394275,00.html>.

¹⁴ See "The Battle for the Last-mile," *The Economist*, May 1, 1999.

¹⁵ See "The Faster Web," *PC Magazine*, April 20, 1999 p158(1).

¹⁶ See "Can You Find the Wireless Runner", *America's Network*, <http://www.americasnetwork.com/issues/99issus/990201/990201run.htm>.

¹⁷ See "The other side of wireless," *Telephony*, March 8, 1999, and "Can You Find the Wireless Runner", op. cit.

¹⁸ See *Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996*, CC Docket No. 98-146, Federal Communications Commission, 1/28/99, p. 23.

¹⁹ See "The Faster Web," *PC Magazine*, April 20, 1999 p158(1).

²⁰ An "overbuilder" is a cable operator competing for the same customers as an incumbent cable operator. Overbuilders are only present in a limited number of markets. Only about 1% of cable subscribers were overbuilders' customers in June 1998. (*Annual Assessment of the Status of Competition in Markets for the Delivery of Video Programming*, CS Docket No. 98-102, Federal Communications Commission, 12/17/98, p. 81 and Appendix B-1)

²¹ Of the 149 franchises issued to cable overbuilders, 87 of them were issued to Ameritech, 18 to BellSouth, 10 to GTE. (*Annual Assessment of the Status of Competition in Markets for the Delivery of Video Programming*, CS Docket No. 98-102, Federal Communications Commission, 12/17/98, pp. 72-73)

LEC.²² Thus, the two incumbents will each have substantial market power because there are no good alternatives to their physical networks. Under the best of circumstances, last-mile broadband transport is likely to be a duopoly controlled by the incumbent local cable operator and the incumbent LEC in most geographic markets.²³ Whenever there is a small number of suppliers of a product for which there are no good alternatives, suppliers will have market power.

While the incumbent cable operator and LEC are likely to have a duopoly in the broadband last-mile transport market, the incumbent cable operator is likely to be the dominant firm in each geographic market. First, cable modem service has a first-mover advantage – residential cable modem subscribers already outnumber residential DSL subscribers by at least 3 to 1 (one estimate is as high as 28 to 1)²⁴ – and first-movers often retain market share as markets mature.²⁵ And in many areas, there will be no affordable,

²² Competitive local exchange carriers (CLECs) are a small presence with little effect in the market for last-mile broadband transport. CLECs lease most of their lines from ILECs and focus on business customers, so they are unlikely to exert much independent competitive restraint on the dominant suppliers of broadband last-mile transport. CLECs provide only about 3% of the switched access lines nationwide. Moreover, they lease most of the lines they supply from the incumbent carrier (see *Trends in Telephone Service*, February, 1999, Federal Communications Commission, p. 9-1), so the local phone company prices are a floor for the competitive carriers' prices. Many CLECs focus on the business market, or on the "small office, home office" market. (See "Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996," CC Docket No. 98-146, Federal Communications Commission, 1/28/99, pp. 7, 30) In mid-1998, CLECs had operational collocation arrangements in switching centers serving about 44% of business customers but only 25% of residence customers. (*Trends in Telephone Service*, February, 1999, Federal Communications Commission, pp. 9-1 – 9-3)

²³ Dale Hatfield, Chief of the FCC's Office of Engineering and Technology, agrees: see, e.g., "The Role of Wireless in Realizing the Broadband Future," remarks by Dale N. Hatfield at the Wireless Communications Assoc. 5th Annual Technical Symposium, 11/3/98 (http://www.wcai.com/ts98_hatfieldspeech.htm).

²⁴ According to the Yankee Group, cable modem installations outnumbered DSL connections by 17 to 1 (425,000 cable modems and 25,000 DSL connections) at the end of 1998. (PC Magazine, April 20, 1999 p158(1)) *Telephony*, citing Forrester Research, says that at the end of 1998, cable modems outnumbered DSL connections by 28 to 1 (700,000 cable modem subscribers and 25,000 DSL subscribers); the DSL figure didn't include every potential customer, but covers most of the major metropolitan areas. ("Beaten to the punch," *Telephony*, Oct 19, 1998 i0040-2656) Jupiter Research says that in 1999, residential cable modems will outnumber residential DSL connections by 3 to 1 (1.2 million cable modems and 400,000 DSL connections). ("Last-mile Strategies," Jupiter Communications, August, 1998, (<http://www.jup.com/research/bas/samples/reports/9808/>))

²⁵ Jupiter believes that cable modems will be the dominant consumer access technology because, in part, of cable modems' aggressive rollout schedules. ("Last-mile Strategies," Jupiter Communications, August, 1998, (<http://www.jup.com/research/bas/samples/reports/9808/>)) "There is a race to be first to offer Internet access and ultimately telephone service to the upscale neighborhoods that will buy it first," said Howard Anderson, president of the Yankee Group, a media consulting firm. "It's called the 'first-move advantage.' If customers go with the phone companies, it will be hard, if not impossible to lure them back to cable. So cable companies want to get big so they have as much cash flow as they need to build their Internet business. Size is everything." ("2 Huge Cable TV Companies to Unite in \$53 Billion Deal," *New York Times*, 3/23/99) (news folder) Petrin found that the first-mover advantage Chrysler obtained in the minivan market were significant – ten years after its introduction of the minivan, Chrysler still controlled over half the minivan market. (A. Petrin, 4/20/99, "Quantifying the Benefits of New Products: The Case of the

ubiquitous, mass market alternatives for residential consumers to cable broadband last mile transport. DSL service will have a smaller footprint because it cannot be supplied to households that are located too far from the telephone companies' central offices, or to households served by certain telephone company equipment that is incompatible with DSL. Estimates of the number of households that DSL cannot serve range from 20 to 50 percent,²⁶ meaning that cable modem service may be the only provider in up to 50% of residential homes. Most prominent analysts agree that cable modems will have a dominant share of the consumer broadband access market in the future.²⁷ Of course, even if cable companies do not dominate to duopoly, they will still have substantial market power since there will be only one other significant provider of broadband last mile transport services.

Minivan," manuscript, University of Chicago Business School, available at <http://gsbwww.uchicago.edu/fac/amil.petrin/research/minivan.pdf>, verified 7/1/99).

²⁶ The leading type of DSL service, ADSL, cannot currently be offered on copper loops longer than 18,000 feet, and over 20 percent of all U.S. lines exceed that limit. For high speeds, the maximum loop length is 12,000 feet. "With some 40 to 50 percent of the BOCs' copper lines falling over 12,000 feet, the market for high-quality ADSL services remains limited. It is also currently not possible to provide ADSL service over digital loop carriers (DLCs) (which work as aggregators, hooking up multiple lines into a larger pipe, such as a T-1). Up to 30 percent of copper lines in service are served by DLCs, and 50 percent of new lines installed are served by DLCs. Residences are far more likely to have loops longer than 18,000 feet or loops served by DLCs than businesses. ("Last-mile Strategies," Jupiter Communications, August, 1998, (<http://www.jup.com/research/bas/samples/reports/9808/>). Ameritech estimates that xDSL will not work on 45% of its loops today, and may never work on 20% of them (*Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996*, CC Docket No. 98-146, Federal Communications Commission, 1/28/99, pp. 24-25).

²⁷ Forrester Research predicts that cable modem service will capture 80 percent of the residential broadband market, and DSL will take 20 percent ("High-speed Internet Access To Reach 16 Million U.S. Households By 2002 According to Forrester," Forrester Research press release, 9/1/98, www.forrester.com/ER/Press/Releases/Standard/0,1358,21,FF.html). Jupiter Communications projects that cable modems will outnumber DSL connections by two to one, and says that "cable operators are well-positioned to be the dominant providers of broadband access to residential customers in the future." ("Last-mile Strategies," Jupiter Communications, August, 1998, (<http://www.jup.com/research/bas/samples/reports/9808/>). I have not seen any analysts' predictions of such overwhelming dominance by DSL, though Allied Business predicts that DSL subscribers will outnumber cable modem subscribers by 2004 ("ADSL Will Overtake Cable," *Wired News*, 12/18/98, <http://www.wired.com/news/news/technology/story/16922.html>).

Appendix B

Investment analysis

1 Summary of results

The first column below shows revenue and investment per subscriber for cable TV alone. The second column shows the investment necessary to produce phone and broadband last-mile transport service given that cable TV facilities are already in place, and the additional revenue that would be produced by such an investment. Similarly, the third column shows the investment necessary to produce broadband last-mile transport service given that the facilities necessary to produce cable TV and phone service are in place, and the revenue that would result from such an investment.

	cable TV	incremental phone plus broadband	incremental broadband given phone
local phone rev. per. subs.		\$ 45	
toll phone rev. per subs.		\$ 5	
broadband rev. per subs.		<u>\$ 26</u>	<u>\$ 26</u>
total monthly rev. per subs.	\$ 42	\$ 76	\$ 26
investment per subs.	\$2,109	\$2,350	\$350
revenue per \$ investment	0.0199	0.0323	0.0743
better than cable by	—	62%	273%

Revenue per dollar of investment from phone and broadband is 62% greater than revenue per dollar of investment from cable TV service. Under reasonable assumptions, this means that, even if ISP income is zero, the return to investment in phone and broadband last-mile transport facilities is 62% above the normal rate of return;¹ this is certainly enough to provide incentive to invest. If it is taken as given that investment in phone facilities will take place, then investment in broadband last-mile transport facilities will yield a return 273% above the normal rate of return, making investment in broadband facilities extremely attractive.

¹ Investments that are expected to earn a return above the normal rate are worth making. See Section 3, below, for a discussion of the relationship between revenue per dollar of investment, net present value, and internal rate of return.

2 Data sources

Cable

Revenue per month per subscriber, \$42, is from the FCC's annual report on competition in video markets.² I simply divided annual revenue per subscriber by 12.

Investment per subscriber is the average price paid per subscriber in all 11 consummated cable company sale from July 1997 to June 1998; TCI is not included in the average.³ The appropriate measure of investment is the price per subscriber AT&T would receive if it sold its cable companies, because I assume AT&T plans to keep its cable companies, and the cost of keeping them is the value of the foregone opportunity to sell them. Lower figurers are conservative; that is, the value of investment in telephone and broadband Internet transport relative to investment in cable is understated when the investment in cable is understated. The price AT&T paid for TCI was \$2,923.⁴ AT&T paid even more per subscriber for MediaOne, because its network was more advanced than TCI's.⁵

Phone revenue

Revenue from local telephone service, \$45 per subscriber per month, is Merrill Lynch's estimate of revenue MediaOne would have received from its cable telephony service if AT&T had not taken over.⁶ Credit Suisse First Boston Corporation says it assumes MediaOne will get \$50 per subscriber, and that Cox gets \$55.⁷ *Telephony* says that second line take rates for many cable operators is 50%, well above the national average.⁸

Toll revenue per residence toll subscriber is from an AT&T statement to the press that "for most consumers, the average monthly long-distance bill is \$17."⁹ This is conservative in comparison with other data sources. A *Fortune* magazine article cites Yankee Group data that puts AT&T's toll revenue per residence customer in 1995 at \$27, while MCI got \$49 and Sprint got \$67 per residence customer per month.¹⁰

Based on customer surveys and focus groups done by AT&T last year, AT&T claims that two-thirds of all customers and more than 90% of high-volume users want to buy a bundle.¹¹ I assume, conservatively, that only half of AT&T's local cable telephony subscribers will buy AT&T toll service, so the expected toll revenue per local subscriber

² *Annual Assessment of the Status of Competition in Markets for the Delivery of Video Programming*, CS Docket No. 98-102, Federal Communications Commission, 12/17/98, Table B-6.

³ *Annual Assessment of the Status of Competition in Markets for the Delivery of Video Programming*, CS Docket No. 98-102, Federal Communications Commission, 12/17/98, Table C-4.

⁴ *Ibid.*

⁵ "AT&T Has Set Itself Some Tough Challenges," *New York Times*, 4/26/99

⁶ "Media One Group," Merrill Lynch Capital Markets report, April 30, 1999

⁷ "Media One Group," Credit Suisse First Boston Corporation report, 1/7/99

⁸ *Telephony*; Chicago; Mar 1, 1999; Blair King; Mitch Matteau; Volume: 236 Issue: 9 Start Page: 38

⁹ "Weekend warriors: Sprint fights to gain callers with residential flat-rate plan," *Telephony*, Nov 16, 1998.

¹⁰ "What, Me Worry?," *Fortune*, September 30, 1996, v134 n6 pp. 121-4 at p. 124.

¹¹ *Forbes*, April 19, 1999 p190(1)

is \$8.50. But since AT&T already receives 40% of toll revenues, only 60% of the \$8.50, or \$5.10, is incremental toll revenue. The average revenue AT&T will receive from cable telephony subscribers is therefore the \$45 from local and \$5 from toll, \$50. The FCC reports that the average expenditure per household on all telephone services in 1997 was \$67.42/mo, 35% more than I assume.¹²

Broadband last-mile transport revenue

Cable operators with a vertically-affiliated ISP keep a fraction of the broadband Internet access subscriber's subscription fee and share in the value of the vertically-affiliated ISP due to its ownership interest. The ISP gets the rest of the subscriber fee, and fees from online transactions and advertising. Under open access, a cable operator would charge all ISPs the same price per subscriber it charges the vertically-affiliated ISP. The cable operator's payoff per subscriber under open access is therefore

$$f(P) + s(m)[(1-f)P + A + T]$$

where

f = fraction of the subscription fee the cable operator keeps

P = subscription price for broadband Internet access

s = cable operator's share of the vertically-affiliated ISP

m = ISP's market share

A = ISP's advertising revenue

T = ISP's transaction fees from e-commerce

I assume that the cable operator's vertically-affiliated ISP's market share drops to zero, and the ISP's revenues from advertising and e-commerce are both zero, so the cable operator gets simply f(P) per subscriber. I assume that the subscriber fee is \$37, and AT&T's fraction is 70%, so AT&T keeps \$26.

Investment analysts' reports by both Merrill Lynch and Credit Suisse First Boston Corporation both say that the price MediaOne's subscribers pay for broadband Internet access is \$40¹³. Credit Suisse First Boston Corporation says that MediaOne's fraction is 70%, or 28. The FCC reports subscription prices for cable modem service between \$35 and \$60.¹⁴ Jupiter Communications says that subscription prices are between \$35 and \$40, and cable operators' fraction of that is 70% to 80% with the remainder going to the Internet service provider (i.e., RoadRunner).

¹² "Trends in Telephone Service," Federal Communications Commission, February 1999, p. 4-3

¹³ "Media One Group," Merrill Lynch Capital Markets report, April 30, 1999; "Media One Group," Credit Suisse First Boston Corporation report, 1/7/99.

¹⁴ *Annual Assessment of the Status of Competition in Markets for the Delivery of Video Programming*, CS Docket No. 98-102, Federal Communications Commission, 12/17/98, Table B-9; shares are from Table C-3.

Investment in cable broadband last-mile transport and telephony

I assume that the cost of the investment necessary to produce broadband last-mile transport and cable telephony is \$2,350. Jupiter Communications says that the cost of upgrading cable plant to produce broadband Internet transport is \$700 to \$1,200, assuming a 10% penetration rate.¹⁵ Credit Suisse First Boston reports incremental investment costs for various services, exclusive of the basic cable upgrade. It says the incremental cost of offering telephone service given the underlying cable system upgrade is \$800, and the incremental cost of offering broadband Internet access is just the cost of the cable modem, \$350.¹⁶ The Jupiter estimate of \$700 to \$1,200 seems to include the cable modem, but I add it again, just to be conservative. My assumption of \$2,350 is comprised of Jupiter's \$1,200 for the cable upgrade and Internet transport equipment, Credit Suisse's \$800 for telephony, and \$350 for a cable modem.

An AT&T press release regarding AT&T telephony joint ventures with small cable companies says that the investment necessary to produce phone service will range from \$300 to \$500 per home, depending on whether the customer already subscribes to the cable operator's digital video service,¹⁷ well below my estimate of \$800.

The FCC says that "high speed cable modem prices are below \$350. Many predict that these prices will continue to fall significantly, with one commentator predicting that broadband cable modem prices will be below \$150 by the end of 1999."¹⁸ And, as I said, I think I'm double-counting the modem cost.

The investment necessary to produce broadband last-mile transport given that telephony service is already being produced is Credit Suisse Boston's estimate, \$350 for the cable modem alone. Milo Medin, Chief Technology Officer for @Home, said in a recent interview that voice services use equipment that is incremental to broadband Internet transport equipment.¹⁹

Penetration rates

I implicitly assume that penetration for both broadband Internet access and local telephone service is 10%. This assumption is largely for convenience, since the estimate of the cost of a cable system upgrade I used is based on an assumed penetration rate of

¹⁵ "Last-mile Strategies," Jupiter Communications, August, 1998, (<http://www.jup.com/research/bas/samples/reports/9808/>).

¹⁶ "Media One Group," Credit Suisse First Boston Corporation report, 1/7/99.

¹⁷ AT&T press release, "AT&T reaches agreements to form commercial joint ventures with five cable operators," 1/8/99, <http://www.att.com/press/item/0,1193,275,00.html>

¹⁸ *Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996*, CC Docket No. 98-146, Federal Communications Commission, 1/28/99, p. 44

¹⁹ Medin said in his interview that "Since data services don't have the same power requirements as voice, we'll be ready for broadband data before voice" ((*Wired Magazine*, April 1999, <http://www.wired.com/wired/archive/7.04/medin.html>).

10%. This aspect of the method is transparent, since everything is on a per subscriber basis. The table below summarizes the forecasts of penetration rates by other analysts.

	Penetration Rates	
	<u>Internet</u>	<u>Phone</u>
Jupiter ²⁰	6.9%	
Forrester ²¹	12.9%	
Credit Suisse First Boston ²²	11 %	9%
<i>Telephony</i> ²³		10% - 20%
FCC ²⁴		up to 20% in some areas
British cable companies ²⁵		20% - 40%

While my assumed rate of penetration for broadband may be a bit high, my assumed rate of penetration for phone service appears to be too low; these two effects are offsetting. But revenue per subscriber is more sensitive to phone service penetration, so the net effect is likely to be to understate revenue per subscriber. However, my analysis is not very sensitive to penetration rate assumptions – I get the same qualitative result even with penetration rates half the lowest forecast.

3 Revenue per dollar of investment is equivalent to the NPV method under simplifying assumptions

My analysis of revenue per dollar of investment is a simplification of the standard method used by economists to evaluate investments, the net present value (NPV) method. Under the assumption that cost characteristics of cable broadband Internet service, such as service lives and margins, are the same as for cable TV service, and that keeping the cable companies rather than selling them is a positive NPV project for AT&T, then advanced services are a positive NPV project if revenue per dollar of investment for advanced services is greater than revenue per dollar of investment for cable services. I present a brief proof and discussion below:

NPV is
$$NPV = [\sum (R_t - c_t) / (1+r)^t] - I$$

²⁰ “Last-mile Strategies,” Jupiter Communications, August, 1998, (<http://www.jup.com/research/bas/samples/reports/9808/>).

²¹ “Last-mile Strategies,” Jupiter Communications, August, 1998, (<http://www.jup.com/research/bas/samples/reports/9808/>).

²² “Media One Group,” Credit Suisse First Boston Corporation report, 1/7/99.

²³ *Telephony*; Chicago; Mar 1, 1999; Blair King; Mitch Matteau; Volume: 236 Issue: 9 Start Page: 38

²⁴ *Annual Assessment of the Status of Competition in Markets for the Delivery of Video Programming*, CS Docket No. 98-102, Federal Communications Commission, 12/17/98, p. 20

²⁵ “NTL’s low-cost multichoice strategy is helping it build market share: The company has a 40% penetration rate in most of its licensed areas-almost twice that of any competitor.” (“Telecom-to-order,” *Forbes*, July 27, 1998)

Assume that revenue for both classes of service, cable and advanced services, is constant over time at R . Assume further that for each class of service, costs are in the same proportion to revenue, $c = kR$. This assumption is conservative despite the fact that promotion costs for advanced services are probably higher for advanced services than for cable. Advanced services are incremental to cable operations, so cable costs include overhead, and this probably outweighs the higher cost of promotion of advanced services.

Then
$$NPV = R \cdot f - I$$

where f is a constant that depends on k , r , and the time horizon.

Denote cable service with a subscript c and advanced services with a subscript a . Assume that cable service is a positive NPV project and revenue per dollar of investment from advanced services is greater than revenue per dollar of investment from cable. We want to show that these assumptions imply that advanced services is also a positive NPV project. By assumption,

$$R_a f / I_a > R_c f / I_c$$

$$R_c f - I_c > 0$$

We wish to show that

$$R_a f - I_a > 0$$

Beginning with our assumption that

$$R_a f / I_a > R_c f / I_c$$

$$R_a f / I_a - 1 > R_c f / I_c - 1$$

$$(R_a f - I_a) / I_a > (R_c f - I_c) / I_c > 0$$

So

$$NPV_a = R_a f - I_a > 0$$

This completes the proof.

Next, I show that the ratio of dollars per revenue of investment for two different investments is equal to the ratio of the internal rates of return of the two investments, under the assumptions given above. Above, we assumed that costs were proportional to revenues, $c=kR$. Assuming an infinite time horizon, the internal rate of return on cable is

$$r_c = \alpha R_c / I_c$$

Where $\alpha = (1-k)$. Similarly,

$$r_a = \alpha R_a / I_a$$

So the ratio of the two rates of return is

$$r_a / r_c = (\alpha R_a / I_a) / (\alpha R_c / I_c) = (R_a / I_a) / (R_c / I_c)$$

This is helpful in interpreting the quantitative results of my analysis. For example, I find that revenue per dollar of investment from advanced services is 62% higher than revenue per dollar from cable. If investments in cable facilities are expected to earn a normal

return, then the result I just proved means that advanced services will earn a return 62% above normal.

4 Summary of conservative assumptions

- 1) I assume no stimulation of quantities due to open access.
- 2) I assume that @Home's share in ISP market drops to zero under open access
- 3) I assume that @Home gets no other revenue, such as advertising and on-line transactions fees.
- 4) My analysis doesn't include costs, just revenue. If costs were taken out of cable investment, it would include overhead, whereas if costs were taken out of incremental investments, it would be only incremental costs, exclusive of overhead.
- 5) The opportunity cost to AT&T of keeping cable companies is probably understated.
- 6) The cost of upgrade is probably overstated.
- 7) Jupiter's cost of upgrade is based on 10% penetration, and telephony services have been getting penetration rates of 10% - 20%; in Britain it's 40% for one carrier offering bundles similar to AT&T's. AT&T will probably get more than other U.S. cable companies because of the value of its brand name and the advantages to consumers of buying a bundle of local and toll telephone service and Internet access. The cost of upgrade per subscriber declines significantly with the penetration rate.
- 8) The investment in facilities used to provide telephony and broadband Internet access will also be used for cable TV services: additional channel capacity, enhanced transmission quality, and digital TV. The value of these services is assumed to be zero.
- 9) Much of the investment necessary for broadband Internet has already been made; for customers served by those facilities, the investment necessary to provide broadband Internet access and phone service is much smaller.
- 10) There is more growth potential in cable telephone and broadband Internet services than in cable TV; cable TV is a mature industry.