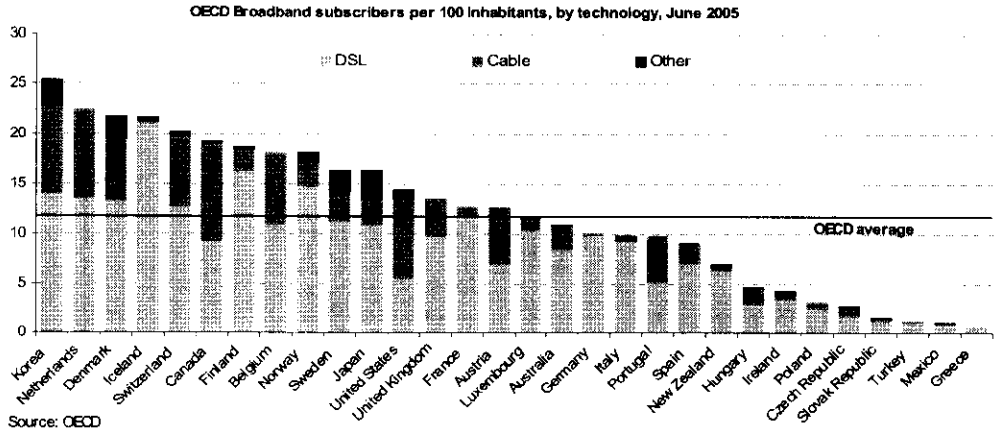
broadband at much cheaper rates and that Korea has the world's highest percentage of individuals who use broadband. A number of reasons help explain the relatively poor position of the U.S. on this measure. Different demographics, population density, and regulatory policies have all likely contributed to these differences. Whatever the source of the U.S. lag, the President and other policy makers have concluded that it is a problem that should be addressed.[6]

Figure 2



Because penetration is limited, the U.S. does not enjoy broadband's full potential. Specifically, broadband could be even more valuable in at least three ways. First, increasing the reach and availability of high-speed services would allow more people to benefit from high-speed services. Second, lower prices from increased competition would make broadband affordable to more people while allowing existing subscribers to

[6] In the words of the President: "[W]e rank 10th amongst the industrialized world in broadband technology and its availability. That's not good enough for America. Tenth is 10 spots too low as far as I'm concerned." President Unveils Tech Initiatives for Energy, Health Care, Internet, April 26, 2004.

pay less than they do now. Reduced prices for existing subscribers do not immediately yield net economic benefits as those subscribers already benefit from broadband services.[7] Lower prices do, however, increase consumer surplus by transferring additional benefits from producers to consumers. Reduced prices that encourage additional households to subscribe yield both increased consumer welfare and net economic benefits. These benefits may be especially pronounced in rural areas and for other under-served populations.

Third, the direct and indirect network effects inherent in broadband-related industries mean that the increase in new broadband subscribers can increase the value of high-speed services to the benefit of all subscribers, new and existing.[8] In particular, broadband-related industries may face a "chicken-and-egg" problem—subscribers increase their demand for broadband connections when more broadband applications are available, but investment in broadband applications only increases with more potential users (broadband subscribers). Thus, increasing the number of subscribers through lower prices and endowing additional households with the ability to access broadband helps to solve the chicken-and-egg problem, leading to even more investment in broadband applications and increased economic benefits. Increased deployment in rural areas, for example, may make it financially viable to launch remote home health services that rely on broadband connections.

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[7] Economists often refer to net economic benefits as "total surplus."

[8] Direct network effects occur when a subscriber benefits from direct interaction with another subscriber and is directly made better off by having more subscribers with whom to interact. Indirect network effects arise from the provision of additional goods and services, such as software, that become more prevalent as producers respond to the size of the network.

Direct network effects also increase the value of broadband services. For example, eBay's value to its users was lower in 1996 when there were fewer Internet users (virtually all using narrowband connections) than it is today to those same users who benefit from a vastly larger number of potential buyers and sellers. Increasing the number of broadband users can have similar effects—some potential innovations may not be profitable without near ubiquity of broadband availability, and many existing services cannot convey nearly the same benefits without the network effects.

B. Magnitude of broadband benefits

Achieving universal broadband coverage (and adoption) could yield significant economic and social benefits. Using several different methodologies, a variety of different researchers have concluded that increased broadband adoption could generate tens and even hundreds of billions of dollars in benefits.

Crandall and Jackson (2001) estimated that universal broadband adoption could yield annual gross consumer benefits of around $300 billion. They use two methods to estimate the benefits, both of which require numerous assumptions. First, they estimate a demand curve for broadband services at $40 per month and assume that increased deployment of broadband services shifts the curve out so more customers demand broadband at any given price because of the increased availability. Based on the new area under this demand curve, they estimate that universal deployment of broadband could result in annual benefits of $300 billion to $450 billion. With 110 million households in the country, this is an annual benefit of about $3,000 to $4,000 per household.

The second approach examines benefits consumers would realize in specific sectors, primarily entertainment, shopping, telephone, commuting, and telemedicine. This approach yields a wider range of benefits ($272 billion to $520 billion). They use these estimates to determine the benefits from more rapid adoption of broadband than "business as usual" and determine that accelerated adoption of universal broadband could lead to total benefits of about $500 billion.

Litan and Rivlin (2001) explore the issue differently – instead of directly estimating consumer benefits, they examine how the Internet could help businesses run more efficiently. They estimate that universal access to the Internet could reduce business costs by $125 billion to $250 billion annually by reducing transactions costs, facilitating communications both within firms and with customers, and increasing competition by making it easier to compare prices and services.

Both 2001 estimates use the principles discussed above – that increased access makes the adoption of new technologies and services more profitable and that network effects increase the benefits to consumers. These estimates, however, were derived several years ago, when many broadband applications, such as Internet telephony, online gaming, and streaming music and videos, had not achieved mass consumer appeal. Some of the uses that have become popular in the last five years could not have been foreseen when that research was being done, and there will assuredly be new uses in the future that we cannot predict now.

The larger number of possible uses of a broadband connection increases its value to consumers. Thus, while the number of possible additional consumers is smaller now

than in 2001, the welfare gains from each new subscriber may be greater than they were at the time.

New estimates suggest even larger gains from accelerating universal broadband penetration. Litan (2005) looks at one specific application of broadband technology – improving the lives of the elderly and disabled. He examines how broadband technologies could reduce health care costs by enabling remote monitoring of health conditions, leading to fewer office visits and reduced need for assisted living facilities. He also explores how broadband could increase productivity by enabling the elderly and disabled to remain in the workforce through telecommuting. He estimates that accelerating broadband access to the elderly and disabled could yield more than a half trillion dollars in benefits over the next 25 years.

Goolsbee and Klenow (2006) take a different approach to estimating the value of Internet services. Rather than calculating consumer surplus based on expenditures only, they account explicitly for time spent by consumers using the Internet. For high wage workers, the cost to using the Internet may be substantially higher than for lower wage workers because of the cost of time involved. Using this and the difference in time spent on the Internet allows them to determine the elasticity of demand for Internet services and consequently to estimate the consumer surplus from Internet usage. Thus, although consumers spend only about 0.2 percent of their income on Internet access, they spend about 10 percent of their leisure time online, suggesting that "consumer surplus from the Internet may be around 2 percent of full-income or several thousand dollars per user." While the methodology differs from the other studies, the magnitude of the benefits is similar.

With several assumptions, we can use the Goolsbee-Klenow approach to estimate the consumer value of connecting the remaining population to the Internet. Fox (2005) reports that according to a survey conducted by the Pew Internet and American Life Project, 22 percent of the American adult population has no Internet access, and 40 percent has only limited access (e.g., narrowband, dial-up users). The Goolsbee-Klenow method suggests that the net present value of improving Internet access for this large group of people could range up to a trillion dollars over the next 25 years.[9] The Crandall-Jackson estimates could also be updated, which would require some additional assumptions, but with only a third of the country on broadband, their methodology would also likely lead to a conclusion that connecting the rest of the country would engender large economic benefits.

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[9] This estimate is highly sensitive to assumptions. The U.S. Census reports an adult population of about 213 million in 2004. We calculate a low and a high estimate. Consistent with research demonstrating a strong correlation between income and broadband connectivity (Flamm 2005), we assume that adults without access have lower-than-average incomes. For the "low" estimate, we assume that the 22 percent with no access have wages only in the 10th percentile of all wage-earners and that the 40 percent with limited access have wages in the 25th percentile of all wage earners. We then assume that those with no access would spend time equal to two percent of their annual wages online (the lower of the Goolsbee-Klenow 2-3 percent estimate). Those who currently have limited access could increase their time spent online by an amount equal to one percent of their wages, since they already spend some time online. Wage data come from the U.S. Bureau of Labor Statistics (http://www.bls.gov/oes/current/oes_00A1.htm). For the "high" estimate, we assume that the average wages of both groups is equal to the 25th percentile of all wage earners, that those with no access currently would spend time equal to three percent of their wages while those with limited access would spend time equal to 2.5 percent of their wages online. Using a discount rate of five percent and assuming that all those people were connected immediately yields a net present value ranging from about a half trillion to one trillion dollars.

Several caveats must accompany these estimates. First, some people currently not connected may simply have little interest in connecting. They would therefore receive few benefits from broadband since they place a low value on it. Second, we assume all potential users would sign up for service immediately; that clearly would not happen. Third, we assume that people who currently have "limited access" would slightly increase the amount of time they spend online. It is possible that people who currently have narrowband connections would actually spend *less* time online if they chose to continue using only those services they currently use.

III. Benefits of competition from M2Z

Policy analysts disagree over why the U.S. lags other countries and whether its position reflects an underlying problem. Reasons why U.S. broadband penetration is lower than in some other countries—and possibly lower than the optimal level—include the possibility that prices are too high, connection speeds too low, and access too limited. Whether broadband penetration is growing quickly enough or not, economists agree that removing artificial and uneconomic barriers to entry is the best way to encourage investment and improve service.[10] Competition is likely to reduce prices, increase quality and increase overall access.

Today, economists almost universally accept that competition in all manner of telecommunications services benefits consumers and economic efficiency. Policies that promote private investment and the resulting competition are likely to be the best approach for improving service, encouraging investment, and reducing prices. Evidence from around the world supports this notion that competition leads to benefits in all of these dimensions. The benefits of competition are readily seen in other telecommunications markets.

Even a century ago—a time when people argued that there were larger economies of scale and density in telecommunications than believed to be the case today—competition among telephone providers brought more investment, lower prices, and better services both in the United States and Europe (e.g., Gabel 1994; Gabel 1969; Wallsten 2005). The same result is true in developing countries today: competition—primarily from privately-owned wireless carriers—has dramatically improved

[10] See, for example, the 2006 statement on broadband policy signed by 25 economists (Bailey, *et al.* 2006).

telecommunications services in those countries (e.g., Li and Xu 2001; Noll and Wallsten 2005; Wallsten 2001).

The same holds true for U.S. wireless service. The FCC initially allocated spectrum licenses to two cellular carriers in each market. While early cellular growth was stronger than expected, service prices remained relatively high until 1994. At that time, the FCC increased substantially the amount of spectrum in the marketplace and allowed multiple additional competitors in most areas. Not surprisingly, prices began to drop. According to survey data from the CTIA – The Wireless Association (CTIA), from December 1994 to December 2004 wireless subscriptions increased by 725 percent (20 million to 167 million) while average revenue per minute declined by 82 percent (from $0.53 per minute to $0.09 per minute).[11] The FCC recently concluded that "competitive pressure continues to compel carriers to introduce innovative pricing plans and service offerings, and to match the pricing and service innovations introduced by rival carriers."[12]

Additional competition has been shown to yield benefits in other telecommunications services, as well. Research by the Government Accountability Office suggests that telecommunications service prices were 15-41 percent lower in cities with the new entrants than in cities without (GAO 2004), and that cable prices were about 15 percent lower in cities with wireline video competition (GAO 2005). Wallsten (2005) shows that regulations that effectively block competitive entry keep the number of Internet users artificially low in developing countries, perpetuating the digital divide.

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[11] The figures from the CTIA surveys should not be considered definitive. CTIA's semi-annual surveys are voluntary, meaning the companies that respond to particular questions may differ from year to year. CTIA reports the raw results from the survey and does not attempt to adjust the figures for the non-respondents or to make the results exactly comparable year-to-year. As a result, the survey data indicate trends, but cannot be presumed to show precise levels.

[12] Federal Communications Commission (2005, para 3).

These different arenas all have a common theme – competition leads to lower prices and higher penetration. This in turn leads to greater benefits for those already on the network as both direct and indirect network effects take hold with greater penetration. However, without competition, the large potential benefits outlined in the section above are unlikely to be realized fully.

Robust competition among existing broadband providers and easy entry by other firms wishing to compete is the best way to increase investment in broadband and achieve the benefits discussed above (e.g., Aron and Burnstein 2003). While most competition in broadband has to date come from cable and DSL, policymakers should recognize that other platforms may become strong competitors if their entry is not arbitrarily blocked (Faulhaber 2002; Weiser 2005).

M2Z is poised to provide new broadband competition for 95 percent of the U.S. population. Adding M2Z to the competitive mix of broadband providers can provide additional benefits because of the scope of its proposed service. Incumbent cable and telephone networks will face additional facilities-based competition throughout the vast majority of their territories. As a result, consumers stand to gain enormous benefits. Even consumers who choose not to use M2Z and continue to subscribe to cable and DSL will benefit as their providers will likely be forced to compete by upgrading service and reducing prices.

IV. M2Z will enhance universal service

M2Z can improve universal service in two ways. First, it will further the objectives of universal service by bringing broadband service to high-cost areas, low-income consumers, rural health care providers, and schools and libraries without

increasing the financial burden on existing universal service programs. Second, in addition to demonstrating that some areas currently thought to be uneconomic to serve may, in fact, be attractive to private investors, M2Z's free service will provide a mechanism that might help control increases in current universal service program expenditures. These effects could reduce future expenditures on universal service and, more importantly, improve the efficiency of communications delivery and increase overall consumer welfare.

A. The current universal service system.

Universal service is one of the largest programs the FCC and state regulatory commissions oversee. The Federal universal service program, which will spend about $6.6 billion in 2006, has four components: high-cost, low-income, schools and libraries, and rural health care.[13] The high-cost program is expected to spend about $4.2 billion in 2006. Federal universal service expenditures for low-income consumers are expected to be around $800 million in 2006, schools and libraries $2.3 billion, and rural health care around $45 million.[14] Many states also have universal service programs, adding to the total cost of universal service.

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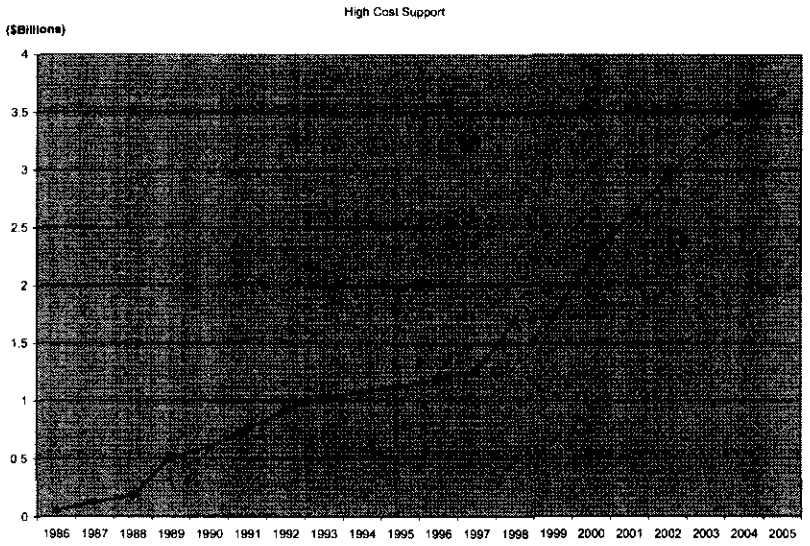
[13] The Universal Service Administrative Company spent about $85 million in administrative costs in 2005 or 1.29 percent of its disbursements (Universal Service Administrative Company, 2005 Annual Report, p. 14).

[14] The low-income program is intended to help poor consumers access affordable telecommunications services. In conjunction with the Telecommunications Act of 1996, the FCC expanded the Federal program for low-income support. This program is divided into two parts – Lifeline and LinkUp. The Lifeline program started in 1985 and was expanded in 1996. It provides a minimum of a $5.25 subsidy per line, plus a Federal match for state funds to further reduce the monthly charge, up to a total of $7.00 per month in total federal subsidy. The LinkUp program reduces the charge to connect a new telephone line by 50 percent or $30, whichever is less. The Federal portion of low income Lifeline and LinkUp programs is about $800 million per year. "Universal Service Fund Facts" available at http://www.universalservice.org/about/universal-service/fund-facts.aspx.

The current universal service system has grown rapidly since the implementation of the Telecom Act of 1996. Figure 3 shows the growth of the high-cost fund for rural carriers over the past 20 years.[15] The overall program for these areas has grown by a factor of three in less than ten years and about ten percent per year for the past five years. These costs have increased while nearly all other telecommunications prices have dropped markedly. A variety of factors explain this increase, primarily changing access charges and reimbursements for eligible telecommunications providers. These increases have put tremendous pressures on traditional support mechanisms, and these pressures will only increase if the program expands to provide broadband services without a major reshaping.

Figure 3



Source: USAC filings.

[15] Note that the data is only for "rural" carriers. The total high-cost fund was $4.2 billion in 2005, of which $3.8 billion went to rural carriers.

The Telecommunications Act of 1996 states that universal service is an evolving concept, meaning that the FCC can extend universal service to support additional services.[16] Recent bills introduced in Congress would expand universal service specifically to include broadband services. The Boucher-Terry "Universal Service Reform Act of 2006" for example, includes broadband service in its definition of universal service.[17] As discussed above, the widespread availability and adoption of broadband is likely to yield great benefits. However, expanding the definition of universal service comes with certain costs – higher universal service payments to cover the new services unless some existing subsidies are cut, and potential market distortions created by the new subsidies.

It is currently unclear how a broadband universal service fund or program would work. It might be layered on top of the existing narrowband universal service fund or may operate completely separately. The design and implementation of any new broadband subsidy, however, should consider carefully the implications of new and quickly changing technologies.

In any event, if the FCC adds broadband to the list of supported services, the Commission would likely strive for a system that ensures service to the customers it wants served, promotes efficiency in service provision, and provides incentives to keep the cost of the system as low as possible.

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[16] Section 254(c)(1) of the Telecommunications Act describes universal service as an "evolving level of telecommunications services," and sets forth the factors to be considered by the Joint Board and the FCC in defining the services that are supported.

[17] See Section 4(c) available at http://www.house.gov/boucher/docs/USF%20Bill.PDF.

M2Z's proposal and system demonstrate that costs of providing new broadband services need not necessarily be higher than the current costs of providing narrowband services. While changing from narrowband to broadband may increase costs above today's narrowband costs in some cases, in other cases advances in technology and spectrum availability may even make it less costly to provide new broadband service with wireless technology than it is now to provide narrowband service with wireline technologies.

B. M2Z can help relieve pressure on the Universal Service Fund

A key question for universal service is how to guarantee service while also controlling costs. M2Z's proposal offers a way of meeting these objectives. M2Z will improve service for a significant number of consumers without increasing outlays from the universal service fund or necessitating increases in contributions to the fund.[18] M2Z's service will be available to "universal service customers" (rural, low-income, rural health care providers and schools and libraries) on the same terms and conditions that it provides service to all other customers, without receiving any money from state or federal universal service funds.

M2Z would not receive any money from the Universal Service Fund and would provide coverage in areas that would likely be eligible for broadband universal service support should such a program be established. Instead, M2Z would commit to providing broadband access at a zero price to all customers including a large number of customers who would otherwise not have access or may not subscribe because of price.

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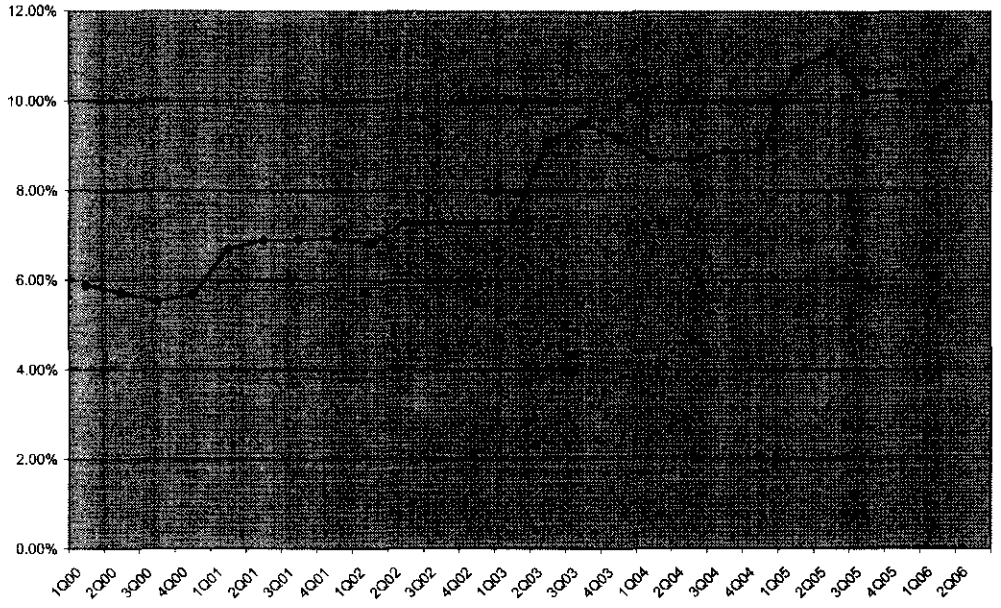
[18] In addition, M2Z's proposal would not add to the USAC administrative burden in collecting and disseminating universal service funds.

The current debate about broadband is part of a larger debate about how to fund universal service. As Figure 5 shows, the contribution factor for interstate services has been growing for the past six years. Part of this is due to the increasing size of the USF and part due to the declining base of interstate revenues.

Figure 5

USF Contribution factor



Source: FCC releases, http://www.fcc.gov/wcb/universal_service/quarter.html.

Many people think that the current universal service funding mechanism is unsustainable because new services like Skype and others promise to reduce the interstate revenue base. As a result, the system may ultimately be forced to use a connection charge, a number fee or some hybrid rather than the current set of charges. Any proposal is likely to face opposition. Changes to the program, however, will be easier to make the lower any new charges are and the better future growth is expected to be controlled.

Ensuring that the universal service charges are lower than they otherwise would be would reduce deadweight loss and thereby improve consumer welfare in a number of ways.[19] Some economists have argued that the current universal service support system causes inefficient market distortions.[20] By distorting consumer behavior, universal service charges create economic losses beyond the amount of money the charges raise. In an economic sense, the universal service charges and payments themselves are simply transfers from one party to another and are not, therefore, economic costs. The effort of raising the funds, however, is costly to the economy. Most of this cost is a result of consumers changing their behavior in response to the charges. Any taxation is costly for this reason. Ballard, *et al.* (1985) estimated that the cost of raising one dollar for the general treasury costs the economy an additional 37 cents. But that amount is small compared to the cost of the current system of raising funds for universal service. Hausman (1998) estimates the cost of universal service charges to be an additional $1.25 per dollar raised, more than three times as large as the general taxation costs calculated in Ballard's work. These costs come from the distortions caused by the existence of the surcharge. By providing a service that does not require such funds, the M2Z service could yield substantial improvements in overall welfare by ultimately allowing universal service charges and their accompanying distortions to be reduced.

With several simplifying assumptions we can calculate a range of savings to the universal service system from M2Z's proposal. First, M2Z could mitigate the pressure

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[19] Deadweight loss in this case refers to the lost surplus from artificially high prices that cause a lower quantity to be sold. In this case, universal service surcharges increase the prices for services that support universal service and consequently reduce the demand for these services, resulting in deadweight loss.

[20] See, for example, Hausman (1998).

for a new broadband universal service fund or an increase in the existing program to include broadband. By its very existence it could demonstrate that such a fund is unnecessary to bring broadband to high-cost and low-income areas. If we assume that the new universal service funds would be $500 million[21] per year without any changes, eliminating 80% of this would save $400 million per year or a net present value of $5 to $7 billion over 25 years.

Additional savings will result because M2Z can be expected to restrain the growth of current USF funding. Specifically, we assume that in the absence of a mechanism to restrain the growth of high cost funding, traditional high cost funding would grow from its current $4.2 billion at 4 percent per year (compared to the current 10 percent annual growth rate). With M2Z, one might assume that the fund would continue to grow, but at a slightly lower rate because M2Z will be competing for high cost customers, but not receiving any money from the high cost fund.

M2Z plans to build its system to offer service to one-third of the population within three years of licensing, two-thirds within five years, and 95 percent within ten years. Assuming this buildout schedule, we estimate a range of potential savings to the USF. For both our "high" and "low" savings estimates, we assume that the universal service fund continues to grow, but at slower rates as M2Z builds out its infrastructure.

For our "high" savings calculation we assume that the high-cost fund growth slows to two percent per year by the time M2Z reaches its target of 95 percent coverage instead of four percent without M2Z. Because in the first year following licensing just

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[21] See, for example, "Senate Bill Expands USF Subsidy To 'Broadband'," TelecomWeb Newsbreak, August 2, 2005, citing the $500 million per year in S.1583, "Universal Service for the 21st Century Act."

over ten percent of the population could be expected to have coverage, the savings would amount to only around $9 million. The annual savings in year five, however, will have grown to $110 million, and by full buildout at year ten the annual savings would be more than $500 million, all in nominal dollars and compared to an assumed alternative growth rate of four percent without M2Z. For our "low" savings scenario, we assume that with M2Z the fund's growth would slow to three percent per year as M2Z reaches full buildout. In this case, the universal service fund would save about $5 million in the first year, and the savings would grow in nominal terms to $55 million in year five and more than $260 million in year ten.

Consistent with general OMB guidelines for cost-benefit analyses,[22] we estimate the net present value of the savings using two discount rates: three percent (for the "high" savings estimate) and seven percent (for the "low" savings estimate) and look at the difference over 25 years. These calculations suggest that the net present value of savings just in terms of a slower rate of increase in the high cost fund could range from around $4 billion to $13 billion over 25 years.

In addition to these savings, there also may be substantial savings and service improvements for low-income consumers, schools and libraries, and rural healthcare providers.[23] However, this report does not quantify those savings. Over the next 25 years, the government could save a substantial amount of money from reduced increases

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[22] *See*, for example, Hahn (2005).

[23] The schools and libraries program is intended to provide telecommunications services and connect schools and libraries to the Internet. Schools and libraries may also be able to use M2Z's system for high-speed Internet access. While the rural health care expenditures are a relatively small part of the universal service system, M2Z may provide some additional benefits here, as well, especially with the ability to provide wireless connections and portable high speed access for rural health care workers. For all of these Universal Service programs, the M2Z system may provide a mechanism to reduce future cost increases.

in the Universal Service Fund. On top of the direct savings, the economic benefits derived from reducing artificial distortions could be very large.

Table 1
Possible USF Savings over 25 years (Net Present Value)

Program	($billions) LOW 3% growth in USF, 7% discount rate	HIGH 2% growth in USF, 3% discount rate
Reduction in USF growth	$3.7	$13.5
Reduction in broadband USF payments	$4.7	$7.0
Total Savings	$8.4	$20.5

There are costs to achieving these reductions in universal service expenditures. The largest is the opportunity cost of the spectrum – it might be used for other purposes that would create higher value to consumers. We have long advocated strongly for auctions and spectrum flexibility and continue to believe that to be the best policy for spectrum use.[24]

C. The goal is maximizing the public interest

The FCC is charged with at least three public interest considerations: promoting the rapid deployment of communication services for the benefit of the public; making communication services affordable and widely available through universal service

[24] Auctions and a reliance on flexibly defined and freely tradable licenses are generally the best way to allocate spectrum. However, under certain circumstances, auctions and flexible use can result in a divergence between private and social value when firms make entry decisions. *See* Hundt and Rosston (1995) "Spectrum Flexibility will Promote Competition and the Public Interest," *IEEE Communications Magazine*, December, 1995 pp 2-5.

programs; and assigning the spectrum resource in as efficient a manner as possible. Occasionally, these policy considerations converge, but in some cases, they do not and the Commission has to choose among the competing considerations. As we discuss below, achieving the best policy outcome requires the FCC to weigh the cost and benefits of its actions with respect to potentially conflicting policy goals.

For example, the current system for universal service is expensive and costly and may become substantially more costly if Congress uses the universal service system to support broadband services. The government has several options to achieve its universal service goals. For example, it can continue to pay for universal services in the traditional way by directly subsidizing companies and consumers; it can attempt to revamp the system in some way to reduce the increase in costs, possibly by restricting the ability of some firms to get support, to limit the number of supported lines, or by some other mechanism; or it might use the spectrum resource to achieve its universal service objective.[25]

M2Z's proposal, the high and increasing costs in the current universal service system, and the limited prospects for large scale reform suggest that the FCC may wish to weigh the tradeoff of spectrum for universal service savings. As discussed above, the FCC would have to weigh the costs and benefits of this proposal. The benefits include quickly moving spectrum into the market, providing additional broadband competition for 95 percent of the population, and potentially reducing the growth in universal service spending as well as demonstrating the lack of need for a new broadband universal service

[25] Another possible way to achieve some of the same benefits would be to auction the spectrum with a series of mandates and commitments including that the licensee provide a high-speed free service to 95% of the population without getting any universal service funding.

program. The primary cost includes the opportunity cost of the spectrum not being used for some other purpose—the cost of not auctioning it. One part of the necessary calculation would be to estimate the likely net proceeds from an auction of 20 MHz of unpaired spectrum.[26] Auction 58 raised about $2 billion in revenue or slightly under $1 per MHz-pop for paired spectrum in the PCS band where technology was already available.[27] Ignoring the potential discounts for unpaired spectrum and a new spectrum band with limited operational and manufacturing scale and any potential premium for a nationwide license, simply applying this gross value to 20 MHz of unpaired spectrum would yield about $5 billion in revenue before the tax deduction offset.[28]

Comparing the gross benefit of revenues from a spectrum auction to the universal service cost savings provides a way to evaluate the tradeoff from awarding the spectrum for M2Z service. With the assumptions made in this paper, the $8.4-$20 billion savings in universal service expenditures would outweigh the $5 billion (less taxes) in auction revenues.

There may be other ways to curtail universal service spending, as well. Chairman Martin recently discussed the option of "universal service auctions" as a means to restrain spending for universal service.[29] Such auctions are one of the many innovative ways to solve the problem of providing universal service efficiently, in addition to using the

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[26] For any auction, the net proceeds to the government are substantially less than the face value of the net bid since companies can be expected to deduct the license costs from their taxable income.

[27] http://wireless.fcc.gov/auctions/default.htm?job=auction_summary&id=58

[28] In the FCC's auction for the 1670-1675 MHz band, a nationwide unpaired 5 MHz block of spectrum sold for $12.6 million in 2003 (http://wireless.fcc.gov/auctions/default.htm?job=auction_factsheet&id=46). Based on that price for spectrum, a 20 MHz unpaired block would sell for about $50 million.

[29] *See* "Martin Likes 'Reverse Auction' Idea for Universal Service" Communications Daily, March 30, 2006.

spectrum resource to that end. For example, instead of completely relying on positive bids for spectrum, the universal service auction principle could be applied and have carriers bid low prices to provide service to customers possibly along with a bid for the spectrum.[30] Such an approach has been used elsewhere, but with mixed results. Chile and Peru were among the first countries to implement such an auction, giving licenses to telecom operators that agreed to serve areas for the smallest subsidy.[31] In Chile, the average winning subsidy from 1995 to 1999 was about half the maximum subsidy the government was prepared to give, while in Peru the subsidy was only about one-quarter as high as expected.[32] India has had somewhat less success with such universal service auctions, with most of the subsidies going to the incumbent for the maximum amount the government was prepared to pay.[33]

The FCC potentially has different options on how to ensure and pay for universal service and how to assign spectrum efficiently into the marketplace. The current method for funding universal service is extremely costly to the economy, as is the delay in getting spectrum into the market.[34] Ultimately, we believe that the Commission should determine which of the available options in front of it best serves "the public interest, necessity and convenience."

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[30] Demsetz (1968) and Williamson (1976) discuss the idea of bidding for a franchise. There are many theoretical ways of designing auctions to generate particular outcomes. They include the concept of reverse universal service subsidy auctions (discussed above), and the concept of auctions limited to those entities that can meet certain threshold qualifications and/or make certain public interest commitments.

[31] Cannock (2001).

[32] Intven (2000).

[33] Noll and Wallsten (2006). In addition, an incumbent service provider may bid for spectrum to prevent competitors from using it.

[34] Hausman (1997), Jackson *et al* (1991) and Rosston (2003) discuss the large losses from the delay in getting spectrum into the marketplace.

V. Conclusion

M2Z proposes an ambitious plan to provide free broadband services. Estimates of the total incremental benefits of more ubiquitous broadband could be quite large – on the order of hundreds of billions of dollars. The M2Z proposal provides a way to accelerate those benefits and lead to their widespread realization.

Should the government accept M2Z's proposal, it would be using spectrum as a way to secure important productivity benefits for the American economy while also saving consumers money. The government can achieve these goals by aligning the nation's spectrum resources with private sector entrepreneurial capital to provide universal broadband service and potentially eliminating the need for additional assessments and subsidies.

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