Getting Online
How Government Regulation Impacts the Way People Surf the Internet

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Executive Summary

Should Internet access via a regular dial-up connection be subject to similar access charges assessed long distance calls? This perennial question is gaining critical mass as new technologies, new services, and new users go online. While there is evidence that the current system is not sustainable in the long-term, there is a short-term interest in maintaining the exemption.

ISPs have been classified by the FCC as enhanced or information service providers, as opposed to a communications service provider. Thus, they are not required to make explicit payments to either universal service funds or to the Bell companies, in the form of usage charges. Consumers incur charges for access involving only local phone billing and ISP service: at present, they do not incur extra fees for accessing the Internet or using it for any given length of time.

As ESI argues in *The Strategic Importance of the Internet: A Framework for Policy Analysis*, Internet policies (or policies impacting the underlying infrastructure of the Internet) should be evaluated on three criteria: How will the policy affect online users and usage?; How will the policy impact the ability of online “Internet Industries” and services to develop and grow?; and How will the policy affect the overall economy that increasingly relies heavily on the Internet for growth?

The ISP exemption from “Internet usage charges” has nurtured the growth of the Internet, creating widespread social and economic benefits. Clearly, the ISP exemption has been a major spur to the proliferation of Internet users. The United States has one of the highest Internet penetration rates in the world, due in large part to the ISP exemption that keeps access costs low. Removing the exemption may deter hundreds of thousands of middle and low income households from getting online. Moreover, the current exemption will continue to pay dividends in the future by helping to foster infant industries on the Internet and to assure fair and equal access across racial and socioeconomic lines.
As the economic analysis shows, this expansion would be highly beneficial for job growth and the economy at large.

This analysis and paper suggest that while an Internet usage charge may be inevitable, for the present, it would prove detrimental to the continuing growth and penetration of Internet use.

How Do Americans Access the Internet, Today and Tomorrow?

There are a number of ways that people access the Internet, and the choice is growing. Traditionally, most households have accessed the Internet through telephone dial-up access, with a modem connected to a standard telephone line. This has not only been the predominant mode of going on-line, but it will continue to dominate online access.

New technologies that provide faster connections to the Internet and private Intranets are now being deployed across the country. Among these new technologies are residential switched digital services, dedicated access, virtual private networks (VPNs), and cable access direct satellite/wireless access. Each of these systems will be designed in such a way that the none are expected to be “mass market” technologies over the next five years. This is important for regulators because it means that households will be using dial-up modems (and be subject to the ISP exemption) for the foreseeable future. Hence, changes to the ISP exemption will have an impact on the vast majority of online households.

Internet Usage Charges: Pros and Cons

There are two basic arguments for levying Internet access charges.

- The monthly line charge paid by consumers to their local carrier is insufficient to recover the costs of providing Internet access, because the rates were set without accounting for the tremendous amount of data usage. While there is no proof in
the record to support this assertion, it remains a valid concern that should be investigated.

- It is argued that the ISP exemption creates market inefficiencies that distort network usage and create perverse investment incentives. Consumers spend more time on-line than they would if there were a time-sensitive cost. This creates a distortion because producers have an incentive to build digital systems where costs are not time-sensitive, so that they do not incur additional costs with increasing usage. But paradoxically, consumers have a disincentive to buy these new systems since they can already get unlimited-time access on dial-up access. Hence, the ISP exemption pushes ILECs to build broadband access networks, while simultaneously creating a disincentive for users to adopt these new broadband services. However, it is important to note that this will be a problem in the future – once these networks are deployed to the mass market. No disincentives exist today.

Based on ESI’s framework for Internet policy analysis, we find several compelling arguments for maintaining the ISP exemption, for now.

**There are substantial “public interest” arguments against levying a fee**

- Traditional access charges are inappropriate. They are far above cost, and do not take into account the differences between long distance access and Internet access. While this does not rule out some form of Internet usage charge, it should not be the current long distance access charge.

- The Internet is a tool for disseminating information, providing educational material and informing the populace on matters of public policy. Therefore, promoting its use through low cost of access is beneficial to the public interest, and should be subsidized.

*Detritmental impact on infant Internet Industries*
Under classic economic definitions, the industries now being formed on the Internet (Internet Industries) are “infant” in nature. This means that Internet Industries are still evolving their business plans, and do not yet capture the full value of their products. This evolution is evident in unsure capital markets (which continue to struggle with evaluations), perpetually changing business plans, and continual losses in excess of what is considered “normal” for start-up companies. While companies and markets search for reason on the Internet, policy changes could have a brutal impact on their ability to grow beyond their infant phase.

**Impact on the Economy**

- The imposition of access charges would both decrease usage time among current users and deter new users from coming on-line. ESI created a model to simulate the effects of the removal of the ISP exemption. The model estimates that the loss to GDP from such an access charge could be anywhere in the range from $2.41 billion to $20.78 billion by 2005, depending on elasticities and growth scenarios. This impeded growth would also imply a loss of between 6,183 and 82,840 jobs. Much of the loss stems from the tremendous spillover effect of the Internet: a host of new technologies and burgeoning industries depend on it for survival. These infant industries have an enormous potential impact on the economy, but are tremendously vulnerable to changes in usage patterns or outright usage declines in the coming years.

**Impact on the Face of the Internet Community**

- In addition to its economic impact, user growth has benefits on its own merits. The current population of consumers with on-line access is seriously deficient in minority and low-income users. A combination of low computer prices and low access charges are beginning to entice more middle and low income households on-line. While this trend is encouraging, it is by no means certain, and major changes in price could lead to major shifts in the online population. Using the same parameters as for the overall economy, it is estimated that
19,800 to 83,600 African Americans ages 16-24 would not go on-line if access charges were increased. Given the Internet’s value as a tool for information, education and access to services, the restriction of these groups from the Internet community would represent a substantial inequity.

**Policy Recommendations**

There are many important policy interests that must be reconciled in order for Americans to reap the full benefits of the Internet. There is an important national need to ensure that Americans have affordable access to the Internet. At the same time, there is a need to discourage inefficient usage of the current telephone network and to promote investment and innovation within the network. Lastly, there is a need for fairness in pricing: consumers should pay only for the services they receive.

- **There is a strong policy need to continue a broad exemption for at least the next twenty four months.**

The ISP exemption has been a great spur to the Internet and encourages greater usage by traditionally disadvantaged groups. The removal of this exemption, at a crucial inflection point in the industry, would have significant, negative affects throughout the economy. Further, given that many aspects of the Internet are in a nascent stage of development and that middle/lower income groups are just now beginning to come online (and there is a policy interest in not slowing this growth), the exemption should continue.

While it continues to promote access, usage, and proliferation, its long term existence promotes inefficient use of network and, therefore, threatens existing local exchange company investment. Consumers need to bear the true cost of the service, in order to have incentive to adopt new technologies and to rationalize their usage.

But in order to preserve the positive aspects of the ISP exemption, the exemption should not be imposed on all users and usage, or phased out immediately. Preferably, an Internet usage charge should not be imposed until their is sufficient build-out of advanced broadband services that are
not time sensitive. Companies have publicly stated that the first phase of broadband rollout are scheduled to be completed in the year 2000. Therefore, investment incentives and usage incentives would be maximized by continuing the exemption for approximately twenty four months. This would also ensure that the U.S. economy and the Internet development are not significantly hindered.

- **The Commission should open a proceeding investigating whether the monthly line charge justly recovers the costs incurred by LECs in the provision on Internet access.**

Monthly line charges should take into account the fact that LECs may be using less network resources to complete local calls – justifying a reduction in rates. A rational basic line charge for Internet access is essential for justifying costing at the inter-company interconnection and ISP tariff levels. It will also ensure that consumers are overpaying or underpaying for their Internet access services.

If the Commission finds that consumers are in fact underpaying for Internet access, the Commission may wish to consider imposing a cost-based usage charge to certain usage levels. One possible alternative that encourages usage of the Internet and its advanced applications, would exempt consumers from paying usage charges on the first, x number of minutes of usage per month. For each additional minute above x, ISPs should be assessed a per-minute charge that they will pass on to consumers. This system incorporates market forces to rationalize usage and spur adoption of new technologies, while ensuring that Internet users are not impeded from accessing the Internet.

- **If at the end of the exemption a cost-based access charge is deemed appropriate, the Joint Federal State Board should determine if a need exists for targeted, limited subsidies for affordable Internet access.**

There are significant reasons to be concerned about information havevs and have nots on the Internet. While there are encouraging signs that middle/low income households will soon be on line, the impact of changes to the basic cost structure may have an adverse affect on the
participation of very low income households. In Europe, for example, access charges have been enough to keep the vast majority of households off line. There is simply not enough evidence to predict reliably the impact of these significant policy changes on the households that may not come on line over the next two years.
Chapter 1: Accessing the Internet: Infrastructure, Fees, and Regulations

Introduction

A pressing policy question facing Congress and the Federal Communications Commission is whether consumers should pay extra fees for accessing the Internet and, perhaps also, per-minute charges for surfing the Internet. This, of course, would be a significant deviation from the current model where people pay no extra charges for getting on-line or surfing the Net.

The specter of extra charges raises important questions for the future of the Internet. Are consumers paying their fair share for Internet access today? How will extra charges impact customer usage patterns and the Internet’s proliferation, particularly among the poor? How will these charges impact the development of ecommerce applications and emerging on-line industries? Moreover, how will these changes translate to the overall economy, which has benefited so handsomely from Internet growth?

This paper examines the consumer considerations of imposing usage charges on Internet usage. It is divided into three sections. The first reviews Internet access and how it is regulated today. It shows that while the Internet is generally regarded as a child born free from regulation, this is not the case in Internet access. In fact, many regulations impact the way in which consumers get online. This chapter examines the manner in which people connect to the Internet, the fees paid by the consumer, ISPs and local communications company, and lastly, the regulations governing service pricing. It pays particular attention to the new ways that consumers will be accessing the Internet and the networks being deployed to handle data traffic. The second chapter examines the impacts of
imposing Internet access charges. Finally, the paper recommends policy action bases on the likely impact of various policy options.

The physical Internet rarely reaches the homes of Americans. The vast majority of consumers and businesses must purchase access to the Internet through one of a number of facilities connecting to the Internet. These “last mile” systems include the cable, telephone, and wireless facilities. Its important to note that while there are literally thousands of different providers of service along with an evolving number if technologies for transmission, there remain a little number of facilities upon which these technologies and providers offer service – particularly in the last mile.

Physical Access Connections

There are a number of ways that people access the Internet, and the choice is growing:

- Traditional telephone “dial-up”
- Residential switched digital service (ISDN [Individual Subscriber Digital Line], xDSL [Digital Subscriber Line]) based on phone networks
- Cable access (optical networks/hybrid networks)
- Dedicated access/VPNs (ATM, frame relay)
- Satellite services (direct-to-home, VSAT, etc.) and terrestrial wireless services

1 This section of the paper does not deal with the Internet backbone(s), architecture, or the payment mechanism between ISPs, backbone providers. The section concentrates on household access to the Internet only with some references to business access.

2 Other access mechanisms include satellite local connections to ISPs (in rural areas), wireless local loop technologies, and global satellite systems. These access technologies, while important to consumers, are not expected to have major effects on the market for the next five years. Hence, they will not affect the current debate over Internet access charges, nor change the fundamentals of that debate.
Telephone dial-up, using conventional modems over a telephone line, remains the overwhelming choice for access among households and SOHOs (small office, home office), while businesses employ dedicated access techniques (e.g., T1s, T3s, and frame relay) although many mobile business employees use telephone dial-up access. The pie chart below lists the various ways that businesses access the Internet.

**Exhibit 2.1: Business Access to the Internet, U.S. Sites**

While many advanced, broadband access services are currently being deployed, only cable is expected to be a major competitor to telephone dial-up access over the next five years. Third generation wireless systems and satellite constellations such as Teledesic are not scheduled for mass market deployment well-beyond the year 2000. xDSL systems are just now being deployed in major cities, and the first stage rollout plans will not be completed prior to mid 1999. One forecast of broadband demand and penetration predicts less than five million residential broadband (i.e., not dial-up) connections in 2002. While the market is expected to grow significantly thereafter, these projections suggest that most on-line Americans will suffer the effects of changes to the ISP exemption.
Telephone Dial-up Access

Most households access the Internet via a regular phone line connection. A personal or network computer with a modem is connected to a standard telephone line. The modem allows the user to dial into the ISP’s computer system attached through the local phone network. The call from user to ISP travels like any other local telephone call. The call is routed to the telephone switch which literally “switches” the call to the ISP's phone number. Once the call is received at the ISP, the ISP’s computer “picks up the phone” and verifies the user’s password and credentials. Once accepted, the ISP allows the user to access services on

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3 Some users must make a long-distance call to access their ISP. The local phone company must then pass the call to a long-distance provider, who then sends the call to another local phone company for termination at the ISP.
its computers (such as email) and to access the world wide web via dedicated connections to the Internet backbone providers.4

Switched Digital Services5

There are many different technologies that alter, slightly, this basic architecture and provide consumers with faster access to the Internet. ISDN6 (integrated services digital network) is by far the most popular, with more than 1 million ISDN BRI7 connections in the United States. ISDN requires an ISDN modem, which turns the phone line into a digital connection, as opposed to a traditional analog one. The local phone company installs a digital line card into its central office switch to handle the digital traffic. The call is routed to the ISP’s computer exactly like any other call.

4 There are significant areas where no Internet backbone is available, forcing the ISP to send information along other parts of the switched telephone network. This is extremely inefficient, imposing extra costs and degrading both the quality and speed of the connection.
5 Frame relay and ATM technology (the two most successful switched digital services) are not discussed in this section, as they are primarily high/middle end business applications that will be little affected by the policy change. Frame relay is a high-speed packet switched protocol used mostly by businesses with locations in different areas. Using available high speed lines, frame relay is increasingly being used by residential, SME, and remote location users. A user can connect to a frame relay switch in the ISP central office via a T1 line. The data streams from the ISP’s frame relay switch to the ISP’s router, and then to the Internet. It provides for data speeds up to 1.544 Mbps (DS-1 speeds). Frame relay requires users to have a router (server) on site, a modem, and special frame relay software to complete the connection.
6 ISDN employs 2 wire loops, each providing 64kbit digital rate speed. The two bearer (B) channels are combined with a basic D channel for signaling.
7 The ISDN BRI (Basic Rate Interface) combines two channels plus the D channel for signaling to provide 144 kbit speed. This differs from ISDN PRI (primary rate interface) which couples 23 B channels with 64 kbit D channel to provide 1.544 mbps data rate.
A digital subscriber line, xDSL, utilizes a slightly different technology and slightly different architecture to provide Internet access. These technologies employ regular copper phone lines, are digital and non-switched, meaning that, like ISDN, these services rely on modems to create digital connections but, unlike ISDN, data sent over xDSL lines do not enter the telephone switch. Instead, phone and data traffic are separated at a “splitter” which allow data traffic to flow directly to the ISP via a router. This allows for much faster transmission rates than either ISDN or traditional dial-up services.

This technology has a number of benefits for consumers and providers, alike. It is an “always-on” connection, allowing the user to access the Internet at any time without tying up the network for voice calls. Hence, when a person is not using the system, network resources are not being used, allowing the facilities to handle demands of other customers. This differs substantially from ISDN or dial-up access, where network resources are engaged anytime the user is on-line – even if the user is not receiving or sending data.

From a financial standpoint, xDSL has an important implications for providers and regulation. Costs are no longer related to the amount of time people are online. Technically, customers are always online. Costs are only incurred when information is sent or received. This makes the current per minute access charge (or proposed usage charge) an ill-appropriate means of compensating the owner’s of these facilities.

The following graphic depicts how ISDN and xDSL technologies differ in physical infrastructure.

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8 The “x” in xDSL represents the many different types of digital subscriber line technologies, including asymmetric (ADSL), high bit rate (HDSL), symmetric (SDSL), individual (IDSL), rate adaptive (RDSL), and very high rate (VDSL).
**Exhibit 2.3: ISDN vs. xDSL**

**ISDN vs xDSL**

Source: TeleStrategies

**Dedicated Access and Virtual Private Networks (VPNs)**

Dedicated access connections are primarily used by corporations. This type of access differs significantly from direct-dial access in two ways: it is not switched by the telephone company’s central office switch, and it is dedicated solely to Internet access. The user purchases a high-speed line (from either the phone company or an alternative provider), which directly connects the consumer with the ISP. The ISP routes the traffic directly into the Internet. While a dial-up connection can be used for any purpose (i.e., you can plug a phone or fax into the socket in the wall and make a call), dedicated access to the Internet only allows the user to access the ISP.

Dedicated access is costly because business users must pay for the cost of a leased line. Using new technologies that have been developed with the Internet, phone companies and ISPs can now provide companies...
with service over public Internet backbones with almost the same quality and security that they can obtain over leased lines. The cost difference between leased lines and VPNs can be as much as five times, sometimes more. As a consequence, corporate use of VPNs based on the Internet has soared and the demand for leased lines to access the Internet has decreased substantially.

Perhaps the most interesting development in VPNs is the effort by auto makers and agricultural firms to establish a VPN for their industry, including the main assemblers and their suppliers. This VPN, known as the Automotive Industry Exchange, or ANX\textsuperscript{9}, will permit auto firms to reduce the payments they have made for costly, 45 to 155 Megabit per second leased lines between facilities as widely dispersed as Michigan and Texas. The ANX will use only certified ISPs that are able to provide the high level of security and quality of service that the industry requires.

ANX is still under development, but is largely in place. It has the potential to cut costs and speed communications so significantly that a group of health care organizations has been in talks with ANX to see if it can join it.\textsuperscript{10}

The graphic below shows the basic architecture of both direct dial-up access (on left) and dedicated access (on right). In a VPN, the business does not need to lease the lines between its firewall and the ISPs’ router, greatly reducing costs because leased lines are quite expensive.

\textsuperscript{9} The ANX was developed by the Automotive Industry Action Group, or AIAG. A description of the network can be found at its web site, http:\www.anx.org.

Exhibit 2.4: Physical Infrastructure Employed in Dial-up Access and Dedicated Access to the Internet

Cable Access

Cable companies have been providing customers with Internet access via cable television networks since 1997 to approximately 300,000 households. Cable systems employ a completely different architecture. Like xDSL or ISDN, the connection is digital from customer to Internet. These systems rely on a modem (a cable modem) and a network interface card (NIC) connected to the cable wire in the home. Residential customers access the network via high-speed cable modems, which attach to their personal computers with a standard Ethernet connection. As the system will be connected to various devices within the home (fax/computer, television, and telephone), the data must travel through a splitter to divide the various transmissions. When a person accesses the cable system, the “call” is routed through the cable system to a regional data center and then directly into the Internet.

For consumers, a key distinction between cable access and telephone access is that there is no separate ISP. The cable company acts as an ISP – for business reasons, as opposed to technical reasons. Customers pay the cable company one monthly fee for the service. This fee covers the costs of the underlying local facilities, the access facilities (typically owned by the ISP), and even some Internet backbone facilities. For the time being, some high-speed data services via cable will employ parts of the telephone network, but eventually, the cable system will operate a completely independent network. The following graphic depicts the network architecture of one cable modem service company, @Work:
Direct Satellite/Wireless Access

Direct satellite access is yet another manner in which consumers are now (and increasingly will be) accessing the Internet. Via satellite, consumers access the Internet by connecting multimedia PCs to their satellite dish. Today’s PCs also require a modem connection to a regular phone line, which functions exactly like a dial-up modem. All outgoing information (computer-Internet) is sent via the phone line, while all incoming data from the Internet is sent via satellite to the user’s satellite dish. This asymmetrical system allows a user to receive data at speeds up to 400 kbits, and send data at conventional modem speeds.

The next generation of systems will allow a user both to send and receive data via the satellite dish, thereby entirely bypassing the local telephone system. For example, the Teledesic system is designed to support millions of simultaneous users. Teledesic will offer a family of
user equipment to access the network. Most users will have two-way connections that provide up to 64 Mbps on the downlink and up to 2 Mbps on the uplink. Higher-speed terminals will offer 64 Mbps or greater of two-way capacity. This represents access speeds more than 2,000 times faster than today’s standard analog modems.

Terrestrial wireless systems are also getting into the access game. The next generation of wireless products will incorporate remote medium-to-high speed Internet and data access. These systems will minimize their use of the wireline PSTN and provide direct wireless to Internet backbone connectivity that maximize access speeds.

**Paying for Access**

While the telephone system remains the overwhelming means of accessing the Internet, the above discussion indicates that many facilities could ultimately participate in providing consumers with Internet access. Each of the facilities involved in the process must be compensated, either through consumer charges or charges between carriers.

**Customer Charges**

There are four types of charges that consumers (business and residential) may pay for access to the Internet:

- set up costs in the home
- local monthly phone line
- monthly toll charges
- ISP charges

The following chart summarizes which charges are paid for each service.
**Exhibit 2.6: Consumer Costs Paid for Each Internet Access Service**

<table>
<thead>
<tr>
<th></th>
<th>Dial-Up</th>
<th>Digital Switched Access</th>
<th>Dedicated/VPN</th>
<th>Cable</th>
<th>Satellite/Wireless</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Set-up costs</strong></td>
<td>Installing a phone line for typical modem service.</td>
<td>ISDN and xDSL services require phone line and special modem.</td>
<td>Installation of server, network access card, and possibly several other components depending on type of digital access. In a VPN, firewalls, routers and software are provided.</td>
<td>Splitter, network interface card, and cable modem</td>
<td>Satellite dish, splitter, PC-satellite board + dial-up set-up components for outgoing transmission.</td>
</tr>
<tr>
<td><strong>Monthly line charges</strong></td>
<td>For analog services, cost of plain phone line.</td>
<td>For digital (ISDN, etc..) cost of digital line. Typically $60 per month for xDSL and $40 for ISDN.</td>
<td>Cost of digital access line – depends on type of line desired. VPN service does not include a line charge.</td>
<td>One monthly charge covers all costs related to local facilities and access to the Internet.</td>
<td>Cost of satellite connection/wireless connection</td>
</tr>
<tr>
<td><strong>Monthly toll charges</strong></td>
<td>Depends on local phone calling plan chosen by consumer</td>
<td>ISDN customers pay per minute charges ranging from 2 cents to 4 cents depending on plan. xDSL customers pay no toll charges.</td>
<td>None. There are some charges for remote access to a corporate VPN using dial-up.</td>
<td>None</td>
<td>Depends on local phone calling plan chosen by consumer. Today, a per minute charge is assessed, however this will not be the case for future systems.</td>
</tr>
<tr>
<td><strong>ISP charges</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>None if leased lines are used for data lines, but yes if they are used for Internet service. ISPs charge for VPN service, but much less than for leased line based Internet service.</td>
<td>No separate ISP charges.</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Source: Economic Strategy Institute
Charges Paid by Service Providers

Internet service providers make payments to several different parties. ISPs pay monthly fees to either local or long-distance telephone companies, for high-speed connections between their offices and the Internet backbone provider. These charges vary widely depending on the types of line leased. ISPs also pay fees to the Internet backbone provider for “ports,” connections to the Internet itself. The chart below depicts the typical ISP interconnection schematic, and details the costs paid by ISPs to local phone companies.

Exhibit 2.7: ISP Interconnection Schematic

Source: MacKie-Mason with selected modifications
Regulating the Access Business

The charges that consumers and ISPs pay, and do not pay, are heavily influenced by regulations governing the local telephone company. As the preceding chart shows, only one of the technologies (cable access) does not rely on the local telephone company, at least for the time being, for physical connections. Regulations govern several cost components of Internet access: the line installation fee, the monthly basic line charge, and Internet access charges.

Regulation of Internet Access

ISPs have been classified by the FCC as enhanced or information service providers, as opposed to a telecommunications service provider, since 1983. This distinction is important, because information service providers are not required to make explicit payments to either universal service funds or to telcos, in the form of usage charges.

Access charges are fees paid by long-distance companies to the local telephone carriers for originating or terminating a long-distance call. These charges are regulated by the FCC and were recently

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11 All of these components are regulated in a variety of ways: consumer charges, quality assurance, depreciation, rate of return, etc.
12 A telecommunications service is defined by the Telecommunications Act of 1996 as transmission "between or among points selected by the user, of information of the user's choosing, without change in the form or content of the information as sent and received." Information services do more than transmit. They have the "capability for generating, acquiring, storing, transforming, processing, retrieving, utilizing, or making available information." In providing access service, the Internet service provider offers all of these services except transformation, processing, and utilizing, according to the FCC. See CC Docket 96-45 Report to Congress, May 19, 1998, paras. 66-93.
13 Originating a call is the process of sending the call through the local network to the point of presence (POP), at which point the call is passed on to the long-distance carrier’s network. Terminating the call occurs at the other end, when a long-distance carrier passes a call from its network to the local carrier for completion to the called party.
recalculated in 1997, in accordance with the Telecom Act of 1996.\textsuperscript{14} While these charges far exceed the long-run incremental costs incurred by the local company when a long-distance call is made, and hence inhibit the market, many telephone companies have argued that ISPs should pay the same charges.

The FCC has debated whether ISPs should be exempt from these charges for more than fourteen years. In 1987, the FCC released a notice of proposed rulemaking to end the exemption from access charges. The Commission asked if, because ISPs utilize the local network much in the same way that long-distance companies employ the local network, access charges were indeed appropriate. The exemption, it was argued, imposed significant costs on the local company network that were not recovered from local telephone customers. In the end, the FCC decided against imposing a “modem tax.” Again, in its \textit{First Report and Order}, issued May 1997, the FCC concluded that ISPs should continue being excluded from access charge payments. According to the FCC, “[m]aintaining the existing pricing structure for these services avoids disrupting the still-evolving information services industry and advances the goal of the 1996 Act to ‘preserve the vibrant and competitive free market that presently exists for the Internet and other interactive computer services, unfettered by Federal and State regulation.’”\textsuperscript{15} In addition, the Commission found that there was ‘no evidence’ of uncompensated costs.

In its report to Congress on Universal Service, the FCC reiterated that ISPs provide information services, not communications services, and that definition exempted them from both usage charges (which are far above cost) and direct universal service contributions. The Commission stressed that ISPs provide much more than basic transmission. While the services they provide are exempt from universal service charges, the underlying inputs are not. The facilities purchased by the ISP from the local company to connect with other ISPs and the Internet backbone are

\textsuperscript{14} Federal Communications Commission, CC Docket No. 96-262. May 7, 1997.
subject to contributions to the universal service mechanism.\textsuperscript{16} Additionally, the FCC stated that some applications provided by ISPs may require contributions to the universal service fund. The primary example is IP-based telephony (phone-to-phone) that provides the same service as traditional phone-to-phone services over the telephone network. The FCC concluded, however, that there was not yet enough information available to classify these as telecommunications services: “We do not believe, however, that it is appropriate to make any definitive pronouncements in the absence of a more complete record focused on individual service offerings.”\textsuperscript{17}

\textsuperscript{16} The FCC is not clear about the extent to which Internet backbone providers are contributing to universal service mechanisms. The Commission intends to review at a later date.

\textsuperscript{17} See, e.g., Federal Communications Commission, CC Docket 96-45 Report to Congress, May 19, 1998, paras. 83.
Chapter 2:  
The Debate over Internet Access Charges

Many issues define the debate over Internet access charges. To date, the heart of the debate has focused on the impact of Internet access charges upon the local telephone network and the Internet access market. However, there has been little discussion in the record of how these charges will affect the Internet itself – and hence the overall economy. As this paper and its companion demonstrate, the regulations impacting the underlying infrastructure of the Internet will indeed have a substantial impact on the Internet and the economy.

Evaluating the Impacts of Access Charges

Six questions must be answered in order to evaluate the impact of Internet access charges:

1. **Cost**: Does Internet access impose uncompensated costs on local exchange carriers?

2. **New Infrastructure Investment**: What are the investment incentives and disincentives created by the ISP exemption?

3. **Above-cost Nature of Access Charges**: Are current access charges cost-based and how would they impact the market?

4. **Infant Industry**: Are Internet-based industries self-sufficient?

5. **Equity Considerations**: How would Internet access charges change the diffusion and equity of the Internet?

6. **Broader Implications**: What are the implications for the U.S. economy?

The first five questions are addressed in this chapter. The last question is the subject of the next chapter’s economic model.
Cost: No Evidence of Uncompensated Costs

The push to end the ISP exemption is based primarily on the argument that the monthly line charges are insufficient to cover the costs of providing Internet access. Monthly line charges are designed to recover the costs of local voice usage, not data usage. Regulators have set the charges by making rational assumptions of telephone usage patterns, circuit-based switching capacity, telephony peak-time usage, and reasonable rates of return. At the crux of the matter is consumer usage patterns for ISP calls, which differ significantly in both duration and growth (minutes of use) from the assumptions made for the regulated monthly line charge. The average Internet usage in the home has gone from 14 minutes in November 1996 to over 45 minutes per day. Additionally, the time spent per call are different: the average voice call is 4 to 5 minutes, while the average Internet connection is 39 minutes. At least in theory, it is true that, as more of the LEC facilities are employed at a higher rate, the greater the cost increases and, therefore, the less likely the monthly line charge will compensate local phone companies for their services.

While it is certain that the current exemption is unsustainable, in the long-run on circuit-based systems, it remains unclear that costs now exceed revenue gained from other Internet-derived streams. While costs may be incurred by the local telephone company, the local telephone companies have, in fact, benefited handsomely from the Internet. Also, second lines in effect double the ability of firms to recovery loop costs without commensurate costs on the telephone company. On the cost 18 This discussion specifically addresses flat rate pricing plans for local phone service.
20 See http://www.netratings.com
22 Telephone companies install two phone lines when initially wiring a home. Activation of a second line, hence, occurs without the same expenditures as installing the initial phone line.
side, the local phone companies point to evidence of switch congestion as an indicator of excessive costs imposed by Internet usage, but, for the time being, these specific cost considerations have been disproved. As shown in the preceding discussion, local phone companies are involved in a number of different steps of the access process: supplying the telephone and high-speed lines to the consumer, supplying the connections from ISP to the Internet backbone, and greater interstate and toll calling. Proponents of the exemption argue that these benefits far exceed the true costs incurred, and, therefore, it is implied that no extra charges need to be applied to compensate local phone companies. It is not clear that ISPs generate burdens for the incumbents.

As seen in the previous section, new technologies may be eroding this problem. xDSL technologies avoid the prospects for revenue-losses by only using network resources when the user is active in the session. In essence, the technology and facilities are configured in such a way as to permit always-on connections without incurring marginal costs based on minutes.

Hence, consumers on these systems do not impose extra costs on the ILECs, and revenue loss is not an issue.

**New Infrastructure Investment: The Investment Paradox**

As a result of this exemption, many commentators (ILEC and others) believe that there are substantial distortions in the market, both in usage and investment. Not being able to recoup per-minute usage charges is a major incentive to build digital, packet switched systems, because these networks are not sensitive to per-minute considerations. Moving to these systems means that local exchange companies will not incur lower earnings, or not see dwindling profits, as consumers spend more time on line.

However, there is an interesting investment paradox created by the exemption. The opposite incentives exist on the demand side. Users are given incentive not to be time sensitive while on the Internet, because most people pay monthly, flat fees. Undoubtedly this creates network inefficiencies. For instance, while writing this study, the author remained
online continuously, although only requiring Internet access 1 or 2 percent of that time. If fees were imposed on a per-minute basis, the author would have rationalized his Internet consumption better – i.e., he would only have been online when needing to access the Internet. But consumers also are more willing to contend with slower Internet speeds without per-minute charges, because there is no financial penalty for waiting. Congestion on the Internet would prompt consumers to buy ISDN or faster broadband applications if they were charged for waiting and could save that time and money by accessing the Internet faster. From a consumer perspective, not paying per-minute Internet charges is a disincentive to purchase faster broadband services such as ISDN.  

Therefore, an investment paradox exists: higher per-minute charges make consumers rationalize network usage and purchase

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23 This analysis assumes that dial-up access and broadband access are substitutable goods – goods that consumers compare when deciding to get online. This is not a universally accepted notion. In a recent affidavit to the Commission [Comments of America Online, Inc. CS Docket 98-178 at Appendix A], Jerry Hausman argues that broadband last mile data transport services are not in the same input market as narrowband last mile data transport services. He bases this conclusion on an econometric analyses of the relationship between current demand for broadband services and the price of narrowband (dial-up access) services. The model shows that there is little relationship between the price of dial-up access and demand for broadband services, i.e., broadband users don’t view dial-up access as a viable substitute. While this analysis may be correct for current users, there are reasons to believe that this good will be a substitute for the majority of users when it is in fact, a mass market service. Currently, broadband access is prices and purchased by “higher-end” users, people who require high-speed connections at a substantial price above the cost of dial-up service. Broadband access customers tend to be more sophisticated users of the Internet (use advanced applications, require more bandwidth) than the current average user of dial-up access. When the service is offered in the mass market, users are likely to view broadband and narrowband services as substitutes, given their lower Internet sophistication and, correspondingly, their lack of familiarity with the product. While this may change over time as people realize the benefits of broadband services over narrowband access, it is certainly likely to exist in the interim. More importantly and precisely from a policy perspective, the mass market will view these goods as substitutes over the next few years, hence raising the concern of an Investment Paradox.
advanced, faster services, while reducing the incentives incumbents have to invest in these advanced, time-insensitive technologies. ISP exemption has limited consumer interest in advanced, time-sensitive technologies (such as ISDN), but has created greater incentives for ILECs to invest in new technologies such as xDSL.23

**Above-cost Nature of Traditional Access Charges**

Traditional access charges, as dictated by the FCC, are inappropriate for recovering the costs incurred from Internet access. The reasoning has two components. Many of the local network functions that are required for making a long-distance call are not required for making a call to the ISP. For example, when a long-distance call is placed, the switch must determine who your long-distance carrier is and bring the call to that carrier’s network. This intelligence is not needed for a dial-up call to an ISP. Nor are there the billing requirements involved with a long-distance provider.

Second, current access charges are inappropriate because they inflate the costs associated with long-distance calls. These charges far exceed the true costs, increasingly defined both here and abroad as long run incremental costs. The FCC agreed with this argument in the Access Charge reform order. According to the report, the current access charge system “contains non-cost-based rates and inefficient rate structures, and this Order goes only part of the way to remove rate inefficiencies.”25 Undoubtedly, access charges designed for and imposed upon long-distance providers are far in excess of costs, and are inappropriate for Internet access. However this fact does not justify, in and of itself, that some other form of usage charges should not be imposed, if dictated by true costs.

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23 Many supporters of usage charges suggest that a flat rate fee could be assessed to all users, based upon average usage. This may reduce the impact on users. However, a flat-rate fee may be worse than a per-minute charge, because it will not rationalize usage and may drop casual users off the Internet. Under any flat-rate plan, usage patterns will not change (e.g., people will still use the Internet inefficiently). While it will provide added incentives for adopting new technologies, it will still not send accurate price signals, necessary for efficient adoption of new access technologies.

25 Ibid., at paras. 345-348.
But clearly, traditional access charges are inappropriate for Internet access.

**Infant Industries**

Internet access charges would clearly have an impact on the way people use the Internet. As shown in the following chapter, people’s behaviors will likely be significantly changed by per minute charges. In evaluating the implications of these behavioral changes, it is essential to understand the nature of the industries now being formed on the Internet and providing the basic foundation for industries. After careful consideration, it is apparent that many of these industries qualify as “infant industries” under classic economic definition.\(^\text{26}\)

The rationale goes that such industries – for a variety of reasons – can not capture all of the benefits of their services. Hence, the firm is not able to earn enough monies to keep it afloat, despite the fact that it is creating significant value for its customers and others. A classic example of an “infant industry” is a factory that produces both a product (e.g., electricity) which it sells at a loss, and pollution (e.g., gold) that floats down the river to waiting prospectors. The firm is generating benefits for the economy, but it is unable to capture enough of those benefits to cover its own costs. Hence, the firm is termed infant. As a result, it was argued that these industries simply could not offer services at a price that would build critical consumer mass and recovery costs. However, it was argued

\(^{26}\)Economic theory holds that these industries are incapable of recovering the true value generated by their goods or services. In these industries, pioneering firms create benefits (information, knowledge, new markets) for which they are not compensated or for which they can not establish property rights. In some cases, the social benefits will exceed the costs incurred by the firm, yet, because of the appropriability problem, no firm will enter. This has been the case for ISPs, which have spurred new online industries without reaping the benefit initially. Also, as is the case with all network-based industries, the value of the network increased with the number of people on the network. The first person who bought an email account received absolutely no value from it, because he couldn’t send or receive email from anyone else. Correspondingly, the more people who get email accounts, the greater the value of an email account to an individual user (and, therefore, the more people are willing to pay for the service).
that, once these industries establish clear property rights and learn to capture the benefits of their goods,. they will be self-sustaining.

Ample evidence suggests that most Internet-based industries are infant. First, very few ventures on the Internet have made posted solid earnings. In fact, most companies have not posted positive earnings before interest, tax, depreciation, and amortization (EBITDA). High-exposure companies such as barnesandnoble.com, amazon.com, excite, lycos, and yahoo have yet to post a profit. While many companies show losses in their first few years, these companies are posting losses because the financial model of the Internet is still changing. While initial losses tend to be associated with start-up costs (customer acquisition, overhead, etc.), Internet companies are still trying to figure out how to make money on the Internet even as their customer base grows. While clearly value is being created by the operations of these companies, it is unclear how many Internet companies can capitalize on these benefits. In other words, right now its unclear how companies make steady and increasing earnings over the long-term.

More evidence exists to suggest that many Internet industries are infant. Financial markets have not developed a clear idea of how to evaluate these companies, making capital flows uneven and unpredictable. Various models of evaluating capital allocation decisions abound – none with support from a critical mass. This confusion is seen in the differentials that exist between similar stocks, and the market’s wild price fluctuations. Also, there is growing concern that many Internet stocks will not weather the a bear market, given their reliance on a continual flow of capital to cover operating losses, and their low cash reserves.

Proponents of the ISP exemption have stated, in other terms, that the exemption does in fact create benefits for the whole economy. As a distributor of information, educational material, and such, it was argued that its growth should be fostered as a matter of public policy. Internet usage charges, which certainly curtail usage, are an inhibitor to web surfing, participating in online town halls, gathering information on candidates, reading the latest medical news, researching for a book report, etc. By exempting ISPs, the government would essentially be encouraging
the use of the Internet, the benefits of which are captured throughout the economy.27

This is not to say that the Internet access business is infant. In the past, petitioners have argue that the Internet access business was an “infant industry” under economic definitions, requiring special regulatory treatment in order to flourish. It is difficult to argue that there is an infant industry problem today, for Internet access, for obvious reasons. The ISP market is now valued at nearly $20 billion, and expected to experience 15 percent revenue growth rates over the next five years. Moreover, analysts now feel that there may be too much competition in the ISP marketplace. An industry shakeout is expected, with as little as 500 of the existing 5500 ISPs surviving ten years from now.

**Equity Considerations**

The Internet is clearly a place reserved for the affluent. As shown in this paper’s companion piece, Internet users are heavily white and affluent. However, trends suggest that this is changing as more middle and lower income households buy computers and find more value in going online. The advent of the $500 computer and the explosion of online services continue to be the two prime drivers of this trend. While the trend is encouraging, it does not take into account a significant shift in Internet access costs. The imposition of costs may slow or hinder this trend.

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27 The argument here is that the benefits of these activities can not be easily captured by ISPs. For example, online research may make kids smarter, and some of these children may go on to patent inventions as a result of the insights they gained online. ISPs may not directly benefit from these inventions. A better educated electorate may, but probably won’t, result in better presidential choices, leading to stronger national and economic security. Again, these benefits can not be fully captured by the ISP, but, rather, are dispersed throughout society.
Conclusion

A careful review of the arguments made by both sides shows a lack of understanding of the impact of access charges on the Internet and the broader economy. Evidence suggests that Internet access is not a substantial financial burden on the incumbent carriers. Moreover, there appears to be no significant traffic management problems created by the Internet (except in select cases).

The exemption creates an investment paradox – encouraging carriers to build advanced networks while discouraging consumers to adopt the services that these networks deliver. As these networks have not been deployed to mass markets yet, this is a problem that will not surface in the short-term (the first phase of ILEC build-out will be finished by mid-2000. Therefore, while the policy may be sustainable and in fact desirable in the short-term, it is not sustainable in the long-term.

Commentators have not weighed important considerations in their policy discussion. The imposition of Internet access charges will certainly change usage of the Internet and may negatively impact critical infant Internet industries. These negative impacts will be felt throughout the entire economy. Moreover, a new generation of less affluent, more ethnically diverse Internet users is poised to get online. A sudden upward shift in prices may thwart the Internet from becoming a more representative and diverse place.

It is important to quantify the impact of this proposed change on the economy and Internet users, before a final assessment of the ISP exemption can be made. In the next chapter, ESI presents a model for measuring the impact of access charges upon overall Internet users and minority adoption.
Chapter 3:
Evaluating the Impact of Imposing Internet Usage Charges:
The Use of Demand Price Elasticity

To estimate how much those charges might affect the business of ISPs, economists depend on estimates of the price elasticity of demand. This represents how much demand might change due to an increase in prices. Assuming that all of the new fees and access charges would be passed along to consumers, the price elasticity makes it possible to estimate how much demand will be decreased by any increase in prices.

In addition to the conservative numbers employed in this study, there are two reasons why the following model is very conservative:

1. Since the preferences of those who are not online have not been measured, the elasticities used are for existing online subscribers and may substantially understate the income constraints of people considering going online.
2. Current available measurements of consumer elasticities are biased to higher income groups and younger people than the general population or the general Internet population.

As the previous discussion indicates, the forces driving demand and content on the Internet are both infant and constantly changing. These two facts makes it very difficult to predict macroeconomic shifts over the long run. As Internet usage charges are applied, more consumers will opt for xDSL and cable alternatives that are non-time sensitive. Changes in the composition of Internet users may demonstrably impact the types of services and industries that succeed online, which in turn influences access purchasing decisions.

But all of these changes will not happen overnight, and hence, it is possible to predict impacts in the near future. New networks are still
being built; embedded plant exists on the ISP and consumer side of the connection; contracts are locked-in. Hence, there will be an effect over the short-term (twenty-four months) that can be measured with reasonable accuracy. The estimates for the year 2005 are given for illustrative purposes only.

The Cost of Usage Charges

The first step is figuring out how much of a charge would be necessary to recovery “cost.” “Cost” is defined here as it has been by the FCC in its interconnection order, based on TELRIC, total element long run incremental costs. Using this elemental approach, the per minute cost of Internet access is between .38 and .49 cents., depending on the exact configuration of the network. But the actual cost per minute would be lower. Today, ISPs pay large fees (approximately $516 million per year) to local exchange companies for connections from the local phone company to ISP offices. These fees will disappear under a usage charge system. When this factor is taken into account, the actual increase in per minute costs, for the first year of the program is between .22 and .31 cents. This leads to a total monthly price increase of between $2.29 and $1.63. The chart below shows the high and low end estimate of cost in the first year.

Exhibit 4.1: Monthly Usage Charge Estimate for First Year of Implementation

<table>
<thead>
<tr>
<th>TELRIC Costs</th>
<th>ISP Realized Cost Savings (per minute)</th>
<th>Expected Monthly MOU (12/98)</th>
<th>Estimated Monthly Usage Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High End</strong></td>
<td>.48 cents</td>
<td>.17 cents</td>
<td>1287</td>
</tr>
<tr>
<td><strong>Low End</strong></td>
<td>.39 cents</td>
<td>.17 cents</td>
<td>1287</td>
</tr>
</tbody>
</table>

There is significant evidence, particularly from countries where access charges have been levied, that consumer behavior would change

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28 Appendix A gives an overview of the economic literature regarding price elasticities in telecom services. Appendix B presents results from a previous ESI study regarding the impact of the Internet on the U.S. economy.
once these fees were imposed. Per minute charges make people more cognizant of their time usage, and hence, reduce inefficient usage. We assume that consumers make more efficient usage of the network, and reduce their base time on-line by 10 percent.

Every year people spend more time online. On average, monthly online time has increased by 25 percent in recent years – a trend that is expected to remain steady or increase (as more applications come online). If average monthly minute growth continues at 25 percent annually, we would expect a comparable increase in access charge fee, paid by consumers. 30 We assume a more modest growth rate (10 percent) in average monthly usage, as indicated below:

<table>
<thead>
<tr>
<th>Year</th>
<th>Average Monthly Usage</th>
<th>Average Monthly Usage Charge (lower estimate)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>1300</td>
<td>--</td>
</tr>
<tr>
<td>1999</td>
<td>1287</td>
<td>$2.83</td>
</tr>
<tr>
<td>2000</td>
<td>1416</td>
<td>$3.12</td>
</tr>
<tr>
<td>2001</td>
<td>1558</td>
<td>$3.43</td>
</tr>
<tr>
<td>2002</td>
<td>1714</td>
<td>$3.77</td>
</tr>
<tr>
<td>2003</td>
<td>1885</td>
<td>$4.14</td>
</tr>
<tr>
<td>2004</td>
<td>2074</td>
<td>$4.56</td>
</tr>
<tr>
<td>2005</td>
<td>2281</td>
<td>$5.02</td>
</tr>
</tbody>
</table>

The average price of unlimited Internet access in the United States is $18.87. 32 Given the above analysis, the implementation of usage charges would increase Internet access prices by 15 percent in the first year up to 27 percent in 2005.

30 The exact range is impossible to determine given the changing dynamics of the Internet.
31 A 10 percent efficiency gain is built into the equation in 1999, by reducing the base number of minutes by a corresponding percentage. Each subsequent year incorporates a 10 percent increase in minutes per year.
How Will Behavior Change?

The imposition of access charges will have two effects on consumers, both of which are interdependent.

- Consumers will reduce their usage of the Internet
- New customers may change their decision to access the Internet

The first effect is difficult to estimate. In the section above, we estimate that people will become more efficient users of the Internet, e.g. disconnecting their connection when not in use. However, usage may change more generally, as people try to minimize their monthly costs. Cognizant of the charge, some consumers may chose to surf less, or shop less, particularly in a narrowband world.

Because the Internet is in such flux, and many of its resident industries are infant, economists have no accurate way of measuring the costs of such a shift. Given the large increase in online banking and online shopping this season, any negative shift in usage could have a substantial damaging impact on the Internet and Internet industries. The impact on the U.S. economy would not be drastic, but rather unseen, as job growth and revenues go unrealized. While ESI does not attempt in this paper to quantify this shift, these unrealized gains could easily total tens of billions of dollars.

The second behavioral impact, changes in the decision to access the Internet, are more easily captured by traditional economic tools. This impact measurement is below.

The Price Elasticity for Internet Access

Because the Internet is new and has not been studied extensively, there is only one good estimate of demand elasticity for the Internet. Our study will use this estimate for the analysis of the effect of new access fees. This section of the paper will also discuss other estimates of demand elasticity for telephone services, such as local calls, long-distance calls.
and international calls. It will also review more recent work that explores how people respond to costs for using the Internet.

Kridel, Rappoport, and Taylor\(^3\) estimate the price elasticity of demand for the Internet by using data for on-line Internet access services, such as America Online, Microsoft Network, CompuServe, Prodigy, SpryNet, Netcom and regional Internet Service Providers (ISPs). They conclude that price elasticity for the Internet range from minus 0.18 to minus 0.38, and that “the demand for on-line access is highly inelastic.” These elasticities, the authors note, are in the “upper range of local usage elasticities or in the lower range of intraLATA toll elasticities,” estimated by Taylor\(^4\) as minus 0.2 to minus 0.4.\(^5\) Since these estimates are the only ones available, we will use them to analyze the impact of Internet access fees.

The estimates obtained by Kridel et. al. reflect the situation for Internet access in May 1996 and may be less accurate descriptions of consumer behavior later in the 1990s. As Kridel and his co-authors note, the Internet penetration in 1996 was directly related to household income, but skewed to younger households.\(^6\) As more households with lower incomes began to use the Internet,\(^7\) it is likely that demand for Internet access would become more elastic. In addition, as Kridel et. al. acknowledge, the results in their paper “suggest that the principal current ‘drivers’ of Internet growth are non-price factors.”\(^8\) If many more users access the Internet to participate in electronic commerce or to save money by gathering information on the price of goods, the growth of the Internet may begin to involve price factors. Current estimates foresee a very large growth in electronic commerce over the next three years, with transactions

\(^5\) Kridel, Rappoport, and Taylor, p. 10.
\(^6\) Ibid., p. 8.
\(^7\) The author thanks Lawrence Chimerine for bringing this possibility to his attention.
\(^8\) Kridel, Rappoport, and Taylor, p. 10.
on the Internet increasing to over $300 billion. This would very likely increase the price elasticity of Internet access.

There are several additional reasons why it may be useful to expect that demand elasticities for the Internet could be higher than the Kridel et. al. estimates. First, the authors recognize that the logit model created a measure of demand elasticity that is very different from what they can measure for local telephone service. In the case of modeling the demand for telephone access, it is possible to distinguish between the benefits derived from usage, upon which the demand for access depends. In modeling, there is a two-stage procedure in which usage is modeled as a function of income, price, and other variables, conditional upon access. The second part of such an approach is to model access in a probit or logit statistical model, in which the consumer surplus from usage is contrasted with the cost of access.\(^{39}\) In addition to asking why people subscribe to phone service, a traditional local-access analysis of price elasticity also includes questions that include class-of-service choice and brand choice issues that are part of the access decisions. In measuring price elasticity for the Internet, the question would be not why a consumer subscribes to Internet access, but “which class-of-service (flat or measured) and which brand (AOL or MSN) should purchase, if I purchase at all?”\(^{40}\) These distinctions are not made in the Kridel et. al. analysis of price elasticity for the Internet.

There are also several externalities that are important to telephone usage and are crucial to the use of the Internet, but that cannot be readily analyzed. Kridel, et. al. note that the type of usage externality known as “the dynamics of information exchange” is an externality of great importance in Internet usage.\(^{41}\) This externality describes the creation of a need for communication “on the fly,” because a call from A to B creates a further need for B to call A, or perhaps for B to contact C, who then contacts D, etc. With the Internet, there is a similar phenomenon, in which a visit to site A can create the need to visit other sites, and connecting to those sites creates the need to visit still more sites. Kridel et. al. have

\(^{39}\) See Taylor, 1994 for a discussion of these models and how they are applied in various situations.

\(^{40}\) Kridel, Rappoport and Taylor, p. 4.

\(^{41}\) Ibid.
called this “the dynamics of information search.” In their paper, Kridel et. al. conclude that Internet usage is ambiguous and difficult to define, in terms of hits on a web site or connection to another computer or computer system. The authors focus their analysis on Internet access and leave the question of determining price elasticity for Internet usage to future research. Nevertheless, a better analysis of Internet usage might suggest better ways to evaluate the price elasticity for Internet access.

What do other studies indicate about price elasticities for the communications industry and for Internet access? From the studies on price elasticity for telephone calls, reviewed above, Cracknell’s recent papers suggest that the price elasticity for the Internet is higher than it was in 1996. Both Cracknell and Taylor indicate that the price elasticity for new services is likely to increase as new subscribers begin to use the service, because these users are more sensitive to price than were the initial users, many of whom are more affluent.

Data in the Kridel, Rappoport and Taylor study also indicate that the subscribers they studied are primarily in higher income groups. Their study shows a very strong relationship between Internet penetration and household income. In addition, they find that Internet use is skewed towards younger households, but with much higher penetration in households headed by those aged 26 to 55. This means that new groups that have significantly increased their Internet usage over the last few years, particularly medium-income and younger users, are not well represented in the price elasticity estimates developed by Kridel et. al.

Still other evidence supports the notion that the price elasticity for Internet access should be higher than the value Kridel et. al. estimated for 1996. Several experts interviewed for this report believe that a value closer to minus 1.0 is more representative of the Internet’s current price elasticity. Banani Nandi, co-author of the Nadiri and Nandi paper reviewed above, has suggested this value. Others, including researchers at

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42 Ibid.
43 Ibid., p. 5.
44 Ibid., p. 8.
the Hatfield Group and Bellcore, have indicated that the value of minus 1.0 is close to the correct price elasticity.\textsuperscript{45}

Using Price Elasticity to Estimate the Impact of Internet Access Fees\textsuperscript{46}

The goal of this exercise is to estimate how much new Internet access fees would affect the use of the Internet and the Internet’s impact on the U.S. economy. From the discussion of price elasticities above, it is clear that the only study to provide estimates for this measure is Kridel et. al. Therefore, we will use those estimates to determine how much new access fees may affect the demand for Internet access. However, given the lack of sufficient study of price elasticities for Internet access, it is also reasonable to create an estimate of price elasticity that reflects some of the changes that may have occurred since early 1996, when the Kridel et. al. data was gathered.

This is a logical approach for several reasons. First, as noted above, Kridel et. al. gathered data at a point in the development of the Internet when usage was very highly correlated with income and not many younger people were users. Second, both Taylor and Cracknell suggest that price elasticity for a new service, such as Internet access, should increase after medium-level users, who are more price sensitive, join “early adopters.” Finally, a number of experts, including Lester Taylor, have suggested to the author that the value for the price elasticity of Internet access should be closer to negative one.\textsuperscript{47}

\textsuperscript{45} The discussion of the research on demand elasticity and the Internet summarizes work at a number of companies, including AT&T, Bellcore, and the Hatfield Group, which have done proprietary research on the Internet. Much of this research has not been published. Some early estimates of demand elasticity for the Internet suggested values in the range of traditional phone service, but the work at AT&T, Bellcore, and the Hatfield Group suggests that the value selected here, minus one, is more appropriate for the current state of the Internet.

\textsuperscript{46} Please see Appendix B for a detailed description of the economic simulation of the Internet and its relation to the economy.

\textsuperscript{47} Lester Taylor noted in an email message to the authors, August 6, 1998:
To be conservative, we will use two levels of price elasticities, one reflecting the results of Kridel et. al., and another – double the Kridel et. al. estimate – reflecting some of the changes likely to have occurred as Internet use has become more widespread. Exhibit 4.3 summarizes the estimates that will be used to evaluate the impact of access fees on the Internet.

**Exhibit 4.3: Price Elasticities for Estimating the Impact of Internet Access Fees**

<table>
<thead>
<tr>
<th>Estimated Price Elasticity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimates from Kridel et. al., Assuming that Internet Users are Primarily Higher Income Users and Uptake is Limited</td>
</tr>
<tr>
<td>Doubling the Estimates from Kridel et. al. to Reflect the Fact that Internet Users include More Medium-Usage Users and a Wider Range of Income Levels</td>
</tr>
</tbody>
</table>

The simplest approach to analyzing the impact of new access fees would be to assume that they would be passed directly along to

“On the size of price elasticities, I think, to begin with, it is important to distinguish Internet access and Internet usage. The only thing that we have been able to do at this point is to look at access, and only in a very indirect way at usage. Since most access is flat rate, there is not much that can be done in teasing out usage elasticities. Still, it seems to me that, like telephone elasticities, usage elasticities will be higher than access elasticities.

Also, I think it important to distinguish between those that already have Internet access and those that don’t. What one is really estimating with most demand models is not an elasticity that refers to an individual consumer, but rather an elasticity that reflects the distribution of individual willingness-to-pay. This is a matter that has troubled me for a number of years, but I have never been able to get a sufficiently clear hold of the problem in my own mind to write about it. What I find interesting, perhaps even amazing, is that in the telephone industry, the elasticities for toll usage that are estimated from these distributions have had such remarkable stability for so long.

Additionally, I think that Internet access is currently driven by various kinds of externalities, which, accordingly, greatly complicate the estimation and interpretation of price elasticities.

Finally, an elasticity of -1 for the circumstances you describe seems plausible.”
consumers. This would mean that the price elasticity for Internet access would indicate how large an impact those fees might have. If the Federal Communications Commission imposed a three to five percent access fee or charge on ISPs, and the ISPs passed it along to their customers, both consumers and corporations, the new fees would reduce spending on Internet services.

How much less spending would there be? The decline would depend on the price elasticity for Internet access that we assume. If we use the Kridel et. al. estimate of minus 0.18 to minus 0.38 for the Internet price elasticity, and also a doubling of those estimates, it is possible to estimate how spending on the Internet is likely to be affected by new access fees. What the Kridel et. al. price elasticities show is that, for a 5 percent increase in price, there should be a 0.18 percent to 0.38 percent reduction in demand for Internet services. There should be five times a 0.18 percent to 0.38 percent reduction in demand for Internet services, or a 0.90 percent to 1.9 percent decrease in demand. For a 3 percent price increase, there would be a 0.54 percent to 1.14 percent decline in demand. If we double the Kridel et. al. price elasticities, for a 5 percent increase in price, there would be a 1.8 percent to 3.8 percent increase in demand.

These reductions in the economic impact of the Internet would mean that the U.S. economy would lose between $0.9 billion and $4.2 billion directly in 2000, and between $0.21 billion and $2.16 billion in 2005. There would be much larger impacts, due to the very large multiplier effects of the Internet. In 2000, these losses would be between $2.1 billion and $12.54 billion, and, by 2005, they would amount to between $7.02 billion and $61.8 billion.
Exhibit 4.4: Impact of a 15 Percent Access Charge on the Internet’s Contribution to U.S. GDP, Annual Losses in Billions of Dollars

<table>
<thead>
<tr>
<th>NET DIRECT ADDITION TO GDP</th>
<th>2000</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Modest Internet Growth</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assuming Lower Price Elasticities</td>
<td>$ .09 Bil to $ .21 Bil</td>
<td>$ .21 Bil to $ .45 Bil</td>
</tr>
<tr>
<td>Assuming Higher Price Elasticities</td>
<td>$ .21 Bil to $ .42 Bil</td>
<td>$ .42 Bil to $ 1.20 Bil</td>
</tr>
<tr>
<td><strong>High Internet Growth</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assuming Lower Price Elasticities</td>
<td>$ .15 Bil to $ .33 Bil</td>
<td>$ .57 Bil to $ 1.18 Bil</td>
</tr>
<tr>
<td>Assuming Higher Price Elasticities</td>
<td>$ .30 Bil to $ .63 Bil</td>
<td>$ 1.02 Bil to $ 2.16 Bil</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>GDP MULTIPLIER CONTRIBUTION OF SUPPLIER INDUSTRIES*</th>
<th>2000</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Modest Internet Growth</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assuming Lower Price Elasticities</td>
<td>$ 2.10 Bil to $ 4.46 Bil</td>
<td>$7.02 Bil to $14.82 Bil</td>
</tr>
<tr>
<td>Assuming Higher Price Elasticities</td>
<td>$ 4.2 Bil to $ 8.88 Bil</td>
<td>$14.1 Bil to $29.7 Bil</td>
</tr>
<tr>
<td><strong>High Internet Growth</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assuming Lower Price Elasticities</td>
<td>$ 8.91 Bil to $18.81 Bil</td>
<td>$14.7 Bil to $30.9 Bil</td>
</tr>
<tr>
<td>Assuming Higher Price Elasticities</td>
<td>$ 5.94 Bil to $12.54 Bil</td>
<td>$29.4 Bil to $61.8 Bil</td>
</tr>
</tbody>
</table>

*Using Higher Value in Range of GDP Multiplier Effects

The largest share of the new jobs created by the expansion of the Internet in the United States is likely to be due to the impact of the Internet.
on the computer, computer software and content industries. Using only net new jobs created by the growth of the Internet, we have estimated that, in 2000, between 206,000 and 450,000 jobs would be created. These jobs are mostly in the industries named above, plus Internet and Intranet service firms. By 2005, the number of jobs created expands substantially, to a range between 687,000 and 2.18 million. 48

Some of these jobs could be lost because of lower demand for Internet services as a result of a fifteen percent Internet access fee. Assuming these fees are passed along to consumers, the price elasticities that Kridel et. al. estimated would indicate that there could be a loss of between 5562 to 11742 jobs and 12,150 to 25,650 jobs in 2000. We note that these calculations assume that the lowest possible job growth occurs under modest Internet growth, and that the highest possible job growth occurs under the high Internet growth estimates. Using a higher estimated price elasticity would result in a loss of 11,124 to 23,484 jobs and 24,300 to 51,300 jobs in 2000. In 2005, if we assume the lower price elasticities, the number of jobs lost would be between 18,549 to 39,159 jobs and 58,860 to 123,720 jobs. If we assume higher price elasticities, double the ones that Kridel et. al. estimated, the number of jobs lost in 2005 would be between 37,098 to 78,318 and 117,720 to 248,520 jobs.

Exhibit 4.5: Job Losses Due to Usage Charges

<table>
<thead>
<tr>
<th>NET NEW JOBS CREATED BY INTERNET IN COHEN STUDY – EXCLUDES WIRED INFRASTRUCTURE</th>
<th>2000</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modest Internet Growth</td>
<td>206,000 to 290,000</td>
<td>687,000 to 978,000</td>
</tr>
<tr>
<td>High Internet Growth</td>
<td>310,000 to 450,000</td>
<td>1.43 mil to 2.18 mil</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ESTIMATED JOB LOSSES ASSUMING A 15% REDUCTION IN DEMAND*</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Modest Internet Growth</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assuming Lower Price Elasticities</td>
<td>5,562 to 11,742</td>
<td>18,549 to 39,159</td>
</tr>
<tr>
<td>Assuming Higher Price Elasticities</td>
<td>11,124 to 23,484</td>
<td>37,098 to 78,318</td>
</tr>
<tr>
<td>High Internet Growth</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assuming Lower Price Elasticities</td>
<td>12,150 to 25,650</td>
<td>58,860 to 124,260</td>
</tr>
<tr>
<td>Assuming Higher Price Elasticities</td>
<td>24,300 to 51,300</td>
<td>117,720 to 248,520</td>
</tr>
</tbody>
</table>

*Assuming the lowest job growth for modest Internet growth and the highest job growth for high Internet growth.

The Impact of Internet Access Fees on Internet Use by Minorities

Another effect of the reduction in spending by consumers and corporations on Internet services may be to reduce the likelihood that certain parts of the U.S. population would use the Internet.
A recent study of the impact of race on computer access and Internet use showed that, in January 1997, 5.2 million African Americans had used the Internet. Among black users of the Internet during the six months prior to January 1997, a larger percentage of users were likely to be ages 16-24 than was the case for whites (43.3 percent vs. 25.1 percent for whites). Whites were more likely to have used the web at home, by a 14.7 to 9 percent margin. The study found that income explained computer ownership, but that education levels affected computer access and Web use.

The study's most troubling finding was that only 32.9 percent of black students owned a home computer, compared to 73 percent of whites. With cheaper computers, this difference should be disappearing. But the study found that, in comparison to white students who did not own computers, black students who were non-owners had far more difficulty gaining access to computers at school or at friends' homes.

It seems reasonable to assume that increased access fees, because of African Americans’ greater sensitivity to price changes, and low incomes, might affect black students. This would mean that higher fees could affect about 43 percent of the 5.2 million black users, or 2.2 million African Americans. If fees rose 15 percent, and we assumed that demand would fall by 2.7 to 5.4 percent, then 2.7 percent to 5.4 percent of these users might not pay for access to the Internet. This would mean that 59,400 to 125,400 African Americans, aged 16 to 24, would probably not pay for access to the Internet. If we assume the higher price elasticities that reflect a broader population using the Internet, 118,800 to 250,800 young African Americans might not pay for access to the Internet. This amount might be higher if the number of African Americans using the Internet has increased greatly since early 1997.

Exhibit 4.6 estimates the amount of spending that might be lost if the number of young African Americans, calculated using price

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49 Thomas P. Novak and Donna L. Hoffman, "Bridging the Digital Divide: The Impact of Race on Computer Access and Internet Use," A shorter version of this paper was published as "Bridging the Racial Divide on the Internet," Science, April 17, 1998.
elasticities, did not subscribe to Internet Service Providers. The amount of lost spending ranges from $15.9 million to $66.3 million.

**Exhibit 4.6: Access Charges Reduce Minority Access to the Internet**

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black Internet Users, January 1997</td>
<td>5.2 million</td>
</tr>
<tr>
<td>Black Users, Ages 16 to 24</td>
<td>2.2 million</td>
</tr>
<tr>
<td>Loss of Users, Ages 16 to 24, Assuming a 15% Reduction in Demand</td>
<td></td>
</tr>
<tr>
<td>- with lower elasticity</td>
<td>59,400 to 125,400</td>
</tr>
<tr>
<td>- with higher elasticity</td>
<td>118,800 to 250,800</td>
</tr>
<tr>
<td>Direct Spending Lost, Assuming Monthly Costs of $22 Per Subscriber</td>
<td></td>
</tr>
<tr>
<td>- with lower elasticities</td>
<td>$15.69 to $33.12</td>
</tr>
<tr>
<td>- with higher elasticities</td>
<td>$31.5 million to $66.3 million</td>
</tr>
</tbody>
</table>

Source: Derived from Novak and Hoffman, "Bridging the Digital Divide: The Impact of Race on Computer Access and Internet Use." A shorter version of this paper was published as "Bridging the Racial Divide on the Internet," *Science*, April 17, 1998.

**Conclusions: Economic Losses from Applying Charges to the Internet**

ESI estimates that the introduction of Internet access fees would have a significantly negative impact on GDP and jobs. There would be a direct loss of between $0.09 and $0.63 billion in GDP in 2000, and an indirect loss of between $2.1 billion and $12.54 billion in the same year. If the Internet continues to grow rapidly, by 2005, the losses would rise to between $0.21 and $2.12 billion in direct losses and $7.02 billion to $61.8 billion in indirect losses.

Job losses would not be very substantial, but could have a significant impact on suppliers of equipment and content for the Internet. We have estimated that, in 2000, there would be 5,562 to 23,484 jobs lost, directly and indirectly, if the Internet shows modest growth, and 12,150 to 51,300 jobs lost if the Internet grows rapidly. By 2005, those job losses would increase to 18,579 to 78,318 jobs, if the Internet grows at a modest pace, compared to 58,860 to 248,520 jobs if the Internet grows rapidly.
Exhibit 4.7: The Impact of Access Fees on the U.S. Economy

<table>
<thead>
<tr>
<th></th>
<th>2000</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GDP LOSSES</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct</td>
<td>$0.09 Bil to $0.63 Bil</td>
<td>$0.21 Bil to $2.16 Bil</td>
</tr>
<tr>
<td>Due to Multiplier Effects</td>
<td>$2.1 Bil to $12.54 Bil</td>
<td>$7.02 Bil to $61.8 Bil</td>
</tr>
<tr>
<td>Total Economic Loss</td>
<td>$2.19 Bil to $13.17 Bil</td>
<td>$7.23 Bil to $63.96 Bil</td>
</tr>
</tbody>
</table>

|                      |                             |
| **JOB LOSSES**       |                             |
| Moderate Internet Growth | 5,562 to 23,484         | 18,549 to 78,318            |
| High Internet Growth  | 12,150 to 51,300          | 58,860 to 248,520           |

|                      | Estimated Using Early 1997 Figures |
| **MINORITY ACCESS**  |                                 |
| Using Lower Elasticity | 59,400 to 125,400 fewer subscribers |
| Using Higher Elasticity | 118,800 to 250,800 fewer subscribers |
| Lost Spending        | $15.6 Million to $66.3 Million |

We have also estimated that Internet access fees could reduce the number of African Americans using the Internet. Using lower price elasticity, 59,400 to 125,400 African Americans would not subscribe to the Internet. Using higher price elasticity, 118,800 to 250,800 African Americans would not subscribe to the Internet. If these numbers are used to estimate the loss in spending for ISPs, they indicate the potential for between $15.6 million and $66.3 million in lower receipts. We expect that many networks would make the transition to becoming primarily data-networks by 2005.

The GNP losses and job growth losses that this study identifies could retard Internet growth in the next few years. This is important, because a number of surveys and studies have suggested that businesses, particularly small- and medium-sized firms, may have difficulty benefiting from the Internet, due to a shortage of trained professionals within their firms and the high costs of investing in Internet technology. In addition, the next few years should open the Internet to wider use by middle and lower income groups and students. Internet access charges could be
especially detrimental to the emergence of new applications, such as electronic commerce. In addition, imposing new charges on ISPs could have other detrimental effects, such as lowering the attractiveness of Internet companies to venture capitalists.
Chapter 4:  

Policy Recommendations:  
Promoting Internet Access in a  
Deregulated, Free Market Environment

The discussion clearly shows that there are many important policy interests that must be reconciled in order for Americans to reap the full benefits of the Internet. A telephone infrastructure policy that does not account for the development of the Internet is simply not in the best interest of the country. There is an important national interest to ensure that regulations do not impede its growth and continued diffusion. At the same time, there is a need to discourage inefficient usage of the current telephone network and to promote investment and innovation of advanced services. Finally, there is a need for fairness in pricing: consumers should pay only for the services they receive, and any subsidization should be transparent and not increase the already excessive taxation. The policy principles that need to be reconciled are:

- Discourage inefficient usage of telephone infrastructure
- Encourage new investment and innovation in advanced broadband services
- Minimize negative impacts to the Internet and U.S. economy

Also, regulations need to fit the coming reality of new networks, usage patterns, and technologies. Under Section 706 of the Telecommunications Act, Congress gave the FCC the authority to review current rules to ensure that new networks and technologies can be deployed in a timely manner.

- There is a strong policy need to continue a broad exemption for at least the next eighteen to twenty four months.
The ISP exemption has been a great spur to the Internet and encourages greater usage by traditionally disadvantaged groups. The removal of this exemption, at a crucial inflection point in the industry, would have significant, negative affects throughout the economy. Further, given that many aspects of the Internet are in a nascent stage of development and that middle/lower income groups are just now beginning to come online (and there is a policy interest in not slowing this growth), the exemption should continue.

**Exhibit 5.1: Expected Economic Losses Due to Implementation of Internet Usage Charges**

<table>
<thead>
<tr>
<th></th>
<th>2002</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP Losses</td>
<td>$2.19 Bil to $13.17 Bil</td>
<td>$7.23 Bil to $63.96 Bil</td>
</tr>
<tr>
<td>Job Losses</td>
<td>12,150 to 51,300</td>
<td>58,860 to 248,520</td>
</tr>
<tr>
<td>Lower Minority Access</td>
<td>118,800 to 250,800 fewer subscribers</td>
<td></td>
</tr>
</tbody>
</table>

While the ISP exemption continues to promote access, usage, and proliferation, its long term existence promotes inefficient use of network and, therefore, threatens existing local exchange company investment. Consumers need to bear the true cost of the service, in order to have incentive to adopt new technologies and to rationalize their usage.

But in order to preserve the positive aspects of the ISP exemption, the exemption should not be imposed on all users and usage, or phased out immediately. Preferably, an Internet usage charge should not be imposed until there is sufficient build-out of advanced broadband services that are not time sensitive. Companies have publicly stated that the first phase of broadband rollout are scheduled to be completed in the year 2000. Therefore, investment incentives and usage incentives would be maximized by continuing the exemption for approximately twenty four months. This provides users with the proper incentives to migrate to advanced services while promoting their deployment in the first place.

- **The Commission should open a proceeding investigating whether the monthly line charge justly recovers the costs incurred by LECs in the provision on Internet access.**
Monthly line charges should take into account the fact that LECs may be using less network resources to complete local calls – justifying a reduction in rates. A rational basic line charge for Internet access is essential for justifying costing at the inter-company interconnection and ISP tariff levels. It will also ensure that consumers are overpaying or underpaying for their Internet access services.

If the Commission finds that consumers are in fact underpaying for Internet access, the Commission may wish to consider imposing a cost-based usage charge to certain usage levels. One possible alternative that encourages usage of the Internet and its advanced applications, would exempt consumers from paying usage charges on the first, x number of minutes of usage per month. For each additional minute above x, ISPs should be assessed a per-minute charge that they will pass on to consumers. This system incorporates market forces to rationalize usage and spur adoption of new technologies, while ensuring that Internet users are not impeded from accessing the Internet.

The Internet usage charge that is imposed should in no way be based on current long-distance access charges. Instead, they should be based on the long-run incremental cost of the network elements involved. The Federal Communications Commission has already determined that these costs are an appropriate means of governing the cost of existing plant and equipment. According to some estimates, this methodology would set the per-minute price of Internet usage at 0.25 to 0.38 cents per minute.

As shown earlier in this paper, the next generation of networks is not time-sensitive – per-minute considerations are not a cost element. Hence, it makes little sense to allow LECs to impose per-minute charges on ISPs when the traffic is routed through the LEC packet-switched data network. LECs can be expected to impose charges on customers that reflect the costs associated with passing the call off to the ISP. At the same time, in order to maintain the incentives to investment by LECs into...

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50 The question to be answered is whether the monthly charge cover the long run incremental costs plus a ‘reasonable’ common cost assignment. Within this framework, the Commission should examine the additional costs related to the extra holding times of Internet calls.
these new facilities, it would be prudent to allow pricing flexibility to the end consumer for these more advanced services.

As shown in this analysis, even this small price impact would have substantial negative impacts for the U.S. economy. By allowing the exemption to exist for a short period of time, the rush to the Internet now underway by middle/low income users would not be delayed.

- **If at the end of the exemption a cost-based access charge is deemed appropriate, the Joint Federal State Board should determine if a need exists for targeted, limited subsidies for affordable Internet access.**

There are significant reasons to be concerned about information haves and have nots on the Internet. While there are encouraging signs that middle/low income households will soon be on line, the impact of changes to the basic cost structure may have an adverse affect on the participation of very low income households. In Europe, for example, access charges have been enough to keep the vast majority of households off line. There is simply not enough evidence reliably to predict the impact of these significant policy changes on the households that may not come on line over the next two years.

It is possible that this mechanism will never be necessary: an 18 to 24 months exemption continuation may be enough to encourage all households to get online. Further, dynamic market forces at work may alleviate the burdens on their own. However, the equity concerns of very low income households raised are significant enough to warrant investigation by the Joint State board at this future date.

With this in mind, there is absolutely no need for a blanket subsidy for all users. Joint Federal State Universal Service Board should not enact a blanket policy. As mentioned earlier, there is an efficiency need to cap the number of minutes covered by any subsidy. After that point, users should pay to rationalize their usage. It is also crucial that any system be designed to be technologically and company neutral.
In addition to preserving market incentives and encouraging Internet usage, this system would be beneficial because it is a transitional mechanism that would obviate the need for additional subsidization of Internet access. A LEC has no need to recoup per-minute costs when packet-switched networks are deployed. The plan is designed to extinguish itself as these networks come on line. American users and Internet application makers would be given a few years to discover the value of being online without having free reign to use the network inefficiently. At the same time, the industries emerging on the Internet would have the opportunity to develop unencumbered by unjustified Internet usage charges.

**Conclusion**

The Internet is one of the most important vehicles for the economy of the next century. Its growth and diffusion has the ability to empower users, create new industries, make existing industries and processes more efficient, encourage trade, and vastly improve our standard of living. The ISP exemption has been a major part of the reason why the Internet has rapidly grown into such an important commercial medium, and not discouraging Internet access via regulations remains a valid public policy goal. However, there is also a need to allow the free market to guide investment and innovation, and to make the costs of Internet access explicit for Americans. The policies crafted in this report will ensure that the Internet is not a place of “haves” and “have nots,” and that telecommunications infrastructure firms are given the right incentives to build and to get customers on the infrastructure of the future. Only when both of these goals are met will America truly reap all the benefits of the information age.

A larger challenge is redefining government-regulated charges for the telecommunications sector, particularly in light of the Internet (IP) and broadband shifts. Per minute access charges, as currently discussed, were designed for a telephone system handling traditional person-to-person calls over analog networks. It will increasingly be obsolete in a world of always-on packet switched networking, and eventually will need to be phased out. The monthly line charge calculation is increasingly irrelevant, as newer network cost structures are realized. As communications usage
patterns shift (from short phone calls to always-on Internet connections), and as networks are updated (from analog to digital, IP-based systems), traditional fees and, in fact, the entire regulated local and long distance phone charging mechanism, will require reform.
Appendix A:
Modeling Elasticities for Telecom Services

How are elasticities usually measured for telephone services? Economists measure price elasticities by analyzing time-series data, using econometric methods. This approach was adopted after Lester Taylor\(^{51}\) showed that longer-run price elasticities were almost always higher than short-run estimates. This resulted in the use of models based on pooled-time-series, cross-sectional estimates to develop price elasticities.

Later studies used similar pooled-time-series estimates. M. Ishaq Nadiri and Banani Nandi did a comprehensive study of U.S. and Canadian calls over the 1938-to-1987 period.\(^{52}\) They found (see Exhibit A.1) that price elasticity for local service was minus 0.3234 for both the short run and long run, minus 0.8168 for toll service in the short run, and minus 0.8949 for toll service in the long run.\(^{53}\) The demand for both local service and toll service are price inelastic, although the demand for local service is more inelastic than that for toll service.

In addition, Nadiri and Nandi found that the number of existing telephones is an important explanatory variable in the demand for local calls, but that the demand for local service is “less sensitive to the growth of real GNP per capita than the demand for toll service.” They concluded that this is logical, because the fees charged for local service have traditionally included a relatively high monthly access charge that entitles

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\(^{51}\) Lester D. Taylor, “Telecommunications Demand, a Survey and Critique” (Cambridge, MA: Ballinger, 1980).


consumers to unlimited local calls. Once a consumer subscribes, the
demand for local calls does not depend on usage price or income. Toll
service is more sensitive to GNP growth, because a large amount of toll
service demand comes from industries and institutions that grow in
relation to the growth of national income.\footnote{Nadiri and Nandi, p. 14.}

Exhibit A.1: Elasticity of Demand for Local and Toll Services

<table>
<thead>
<tr>
<th></th>
<th>Short Run and Long Run</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Local Service</td>
<td>Toll Service</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Short-Run</td>
<td>Long-Run</td>
<td>Short-Run</td>
</tr>
<tr>
<td>Price Elasticity</td>
<td>-0.3234</td>
<td>-0.3234</td>
<td>-0.8168</td>
</tr>
<tr>
<td></td>
<td>(0.0725)</td>
<td>(0.0707)</td>
<td>(0.0710)</td>
</tr>
<tr>
<td>Elasticity with respect to number of existing telephones</td>
<td>0.6206</td>
<td>0.6401</td>
<td>0.4127</td>
</tr>
<tr>
<td></td>
<td>(0.0346)</td>
<td>(0.0331)</td>
<td>(0.0754)</td>
</tr>
<tr>
<td>Elasticity with respect to structural change variable</td>
<td>N.A.</td>
<td>N.A.</td>
<td>2.1179</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.4494)</td>
</tr>
</tbody>
</table>


Nadiri and Nandi noted that the growth in toll service is explained by the increase in the information intensity of the U.S. economy.\footnote{Ibid.} The two authors found that, “Even if price and income are important factors in determining the demand for toll service, these two variables alone cannot explain the exponential growth in long-distance telephone demand in the last two decades.”\footnote{Ibid.} Sectors that are extremely dependent on this service include “banking, finance, telemarketing, airlines-travel, the computer industry, etc.”\footnote{Ibid.} Nadiri and Nandi included a variable in their regressions to take account of this structural change in the economy, the ratio of service sector employment to non-agricultural employment. They found that there is a very positive value of the elasticity of demand for toll services. The value of that elasticity is 2.1179 in the short term and 1.9671 in the long term, meaning that “a more service-based, information-
intensive society plays an important role in explaining the increasing demand for telecommunications services in the last decade.”  

The work of Nadiri and Nandi suggests that structural changes, such as the increasing information intensity of the U.S. economy, result in far greater use of telecommunications services than mere increases in GNP would indicate. It also suggests that perhaps there are other factors that may be taken into consideration in measuring price elasticity, other than the usual economic approach of regression analysis. Research by David Cracknell of British Telecommunications suggests that price elasticities should be measured using different techniques that enable service providers to see where they gain the most benefits by adjusting prices. This also suggests that an approach to price elasticity that provides better pricing for users who have more elastic behavior might offer real incentives to consumers whose real spending decisions are more elastic. In the case explored here, the impact of Internet access fees, Cracknell’s approach suggests that not allowing for greater elasticity might underestimate the real impact of price changes.

Cracknell and Knott suggest that price elasticities need to be measured differently in order to reflect the structural changes that have occurred over the last five years. They note that the growth of competition, the availability of volume-related price discounts, and special price offers are part of the change. Consequently, Cracknell and Knott believe that these different conditions are not well estimated using traditional regression methods to estimate price elasticities. The Cracknell and Knott study explores alternative ways to estimate price elasticities and shows that the elasticities vary widely depending on the way they are analyzed and depending on the situation studied, including special offers. According to Cracknell and Knott, managers are beginning to view elasticities as things they can try to manipulate, as British Telecom began to do with the international call market in the mid 1990s.

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58 Ibid., p. 15.
In the special-offers market, Cracknell and Knott conclude that the calls market is “potentially much more price elastic than would be indicated from traditional broad-time-series-based econometric modeling.”

They also note that “residential customer price elasticities appear to be higher at the weekends than during the week, as more time is available for discretionary communication,” and that “price elasticities on international routes are particularly variable. They appear to be strongest where there is a clear “community of interest” between the distant country and the United Kingdom (such as Australia and New Zealand).

Using a market segmentation approach to price elasticity, Cracknell and Knott show that market price elasticity varies significantly by level of usage. For local calls, elasticity falls steadily with usage, as expected, since many calls are discretionary and there are good substitutes, such as “rapid postal service and greater ease of personal contact.” Long-distance calls, on the other hand, have a price elasticity that is quite low for low users and increases for moderate users, but the elasticity remains rather low for median and high users. For median users, long-distance calls were still a luxury in 1993-4, while there is a low elasticity for high users who are not deterred by the high cost.

Cracknell and Knott do not provide any exact measures of the elasticities they estimate. A later paper by Cracknell suggests that United Kingdom local-call elasticity is about two-thirds that of the United States (the U.S. estimate is minus 0.4), while the price elasticity for national calls in the United Kingdom is about half that for the United States (the U.S. estimate is minus 0.8). For international calls, the price elasticity for cross-sectional analysis is about 1.3 times larger than the U.S. price elasticity, which is estimated to be minus one. The price elasticity for special offers, for international calls, is about double that of the price elasticity for U.S. international calls.

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60 Ibid., p. 327.
61 Ibid., pp. 327-328.
62 Ibid., p. 328.
64 Ibid., p. 102.
Additional detail is provided in Cracknell’s 1997 paper, where he finds a sine wave pattern for the price elasticities of international calls, segmented by usage. Price elasticities are low at the bottom end of the market, increase at the middle of the market, and decline among the highest users. This reflects the “life and death” nature of calls by low users, high elasticity in the middle range where calls are still “perceived as luxury items,” and lower elasticity at the top end, where price is less of a barrier to calling. At the top end of the market, price elasticities are higher than at the lower end.

In interpreting these differences, Cracknell makes a number of points that may apply when we consider price elasticities for Internet usage below. His 1997 paper notes that Taylor describes relatively immature telephone markets where most callers are likely to be “businesses and relatively sophisticated high-residential users.” Cracknell’s own findings in international call markets suggest that, in international markets, as the market develops initially, “price elasticity might be expected to increase as more of the ‘middle range’ residential users start making calls. At some point, however, the maximum elasticity point … is likely to be achieved, and thereafter price elasticity might be expected to decline, as incremental growth derives from the lower usage groups.”

Is this interpretation of United Kingdom international calls similar to cases in other countries? Cracknell presents evidence from studies summarized in Taylor, and by Garin Munoz and Perez Amaral. This

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data shows that, for the United States, the estimated price elasticity for international calls has declined over time, from very high price elasticities in the range of minus 1.6 to minus 2.2, from 1967 to 1970, to a range of minus 0.3 to minus 0.7 in the 1976-to-1996 period.\textsuperscript{72} There was a clear downward trend during the latter period.

Hackl and Westlund\textsuperscript{73} found that price elasticities for international calls on six routes from Sweden, during the 1976-to-1991 period, increased for four routes and then stabilized or declined slightly. The two exceptions were calls to the United Kingdom, where elasticity showed a steady increase, and calls to the United States, where there was a steady decline up to the late 1980s and then a slight increase afterwards. Exhibit A.2 summarizes the price elasticities from their study.

\begin{table}[h]
\centering
\begin{tabular}{|l|c|c|}
\hline
International Route & 1976 & 1991 \\
\hline
Sweden – Germany & +0.2 & -0.8 \\
Sweden – UK & -0.6 & -1.4 \\
Sweden – USA & -1.6 & -0.2 \\
Sweden – Denmark & -0.2 & -1.0 \\
Sweden – Norway & +0.8 & -2.0 \\
Sweden – Finland & +0.2 & -0.9 \\
\hline
\end{tabular}
\caption{International Price Elasticities}
\end{table}


The last two papers that discuss international calls indicate that price elasticities for new and higher-priced services may tend to increase somewhat after the services are introduced, as medium-level users increase. Overall, price elasticities will decline, unless there is a clear trend, as Cracknell indicates in his analysis of international calls, for users with high price-elasticities to dominate spending. Cracknell also


\textsuperscript{72} Cracknell, “The Demand for International Telephone Calls …,” p. 11.

demonstrates that new programs – such as focused, special rates to get medium-level users to make more calls – can not only be successful, but may also be an important competitive strategy used by new entrants to gain market share.\footnote{Cracknell, “The Demand for International Telephone Calls …,” p. 11.} Cracknell provides recent data (1993 to 1997) from British Telecommunications’ international calls, showing that price elasticities peaked in 1995 but then declined to 1997.\footnote{Ibid.}

These studies suggest that price elasticities are higher for national calls than for local ones. They also indicate that price elasticities for some international calls, such as those from the United States to other locations, have fallen significantly over time, to a level between that for local calls and national calls. For overseas calling locations, such as the United Kingdom, there is evidence that services regarded as a “luxury,” such as international calls during the early 1990s, had a relatively high price-elasticity among medium-level users, who found them costly. The price elasticity for international calls among this group was higher than for both low-level and high-level users. Both Lester Taylor and David Cracknell interpreted this result to suggest that, as new services develop, there is a greater chance that price elasticities will increase, because additional users that are more sensitive to price are being added to the overall population using the service. In the section that follows on price elasticities for the Internet, we will refer to this finding.
Appendix B:
The Impact of the Internet on the U.S. Economy

ESI’s study,76 “An Economic Model of Future Changes in the U.S. Communications and Media Industries,” developed a way to measure GDP impacts by analyzing spending on the Internet. That study also created an estimate of the Internet’s multiplier effect, arguing that the Internet multiplier was much greater than traditional multipliers used for telecommunications services.

ESI’s original study provided a unique approach to analyzing the Internet’s growth and the consequences for the telecommunications industry. The study showed that the Internet would become the most rapidly growing part of the U.S. telecommunications infrastructure and would spur the growth of the computer, software and media industries that supported it. It found that, by 2005, between 18% and 38% of spending on wired infrastructure in the United States would be for Internet and Intranet services. This rapid growth would create at least 1.4 million new jobs, and possibly as many as 2.1 million, over the nine years from 1996 to 2005.

That study illustrated a rapid shift to the Internet by corporations and consumers. Using inputs from communications experts, the study forecast that Internet access and corporate Intranets would replace traditional services, such as leased lines, frame relay and other broadband communications, and even traditional long-distance phone calls. According to recent studies and communications analyses, corporations are using the Internet because it is valuable for business-to-business transactions and business-to-consumer sales. In addition, corporations realize that they can save considerable funds by using the Internet.

instance, it is much cheaper to use the Internet than to use high-cost leased lines and broadband connections, so firms are building Virtual Private Networks that run on the Internet and are protected by firewalls.

The ESI analysis found that corporate use is the key factor propelling the Internet’s growth. Using expert opinions, the ESI study constructed two Internet scenarios to depict how rapidly corporations and consumers would begin to broaden their use of the Internet. These were compared to a baseline, telephony-based scenario that did not explicitly recognize the Internet’s growth. For corporations, the study found that expanded use of corporate Intranets began to replace the use of leased lines and broadband communications in the mid 1990s. Wider use of the Internet for long-distance phone calls is taking somewhat longer to accelerate. For consumers, Internet phone calls begin to replace traditional long distance and local calls somewhat after such use has been adopted by businesses.

The expansion of the Internet and of corporate Intranets in these new scenarios, including the high-growth scenario described above, comes at the expense of leased lines and broadband communications services. Internet Service Providers (ISPs) also begin to provide long-distance and local access phone services over Internet Protocol (IP) networks, rather than using the traditional public switched network. These scenarios depict how the Internet might drive the expansion of the U.S. communications infrastructure over the next decade. Much of the high-bandwidth infrastructure built over the next decade is likely to be data networks that will transmit IP-based messages.

The ESI analysis concluded that the Internet would increase U.S. GDP growth, as compared to the growth expected with the baseline projections by Wall Street Analysts. In 2000, modest growth of the Internet and Intranets (Scenario 2), plus traditional wireline communications, would create $192 billion to $206 billion in GDP, compared to $184 billion in the baseline case. Faster growth of the Internet and Intranets, plus traditional wireline communications (Scenario 3), would result in $198 billion to $220 billion in GDP in 2000, compared to $184 billion in the baseline case. This would be a small addition to GDP, between $8 billion and $36 billion new GDP. By 2005, however,
Scenario 2 would add $575 billion to $621 billion to GDP, while Scenario 3 would add $616 billion to $721 billion to GDP, compared to $547 billion in the baseline scenario. Thus, the growth of Internets and Intranets might add as much as $174 billion to U.S. GDP, per year, by 2005.

The GDP figures cited here have been adjusted for substitution effects that might arise as a result of the expansion of electronic commerce. For instance, the two Internet-based scenarios include adjustments that estimate the size of Internet and Intranet transactions that would substitute for sales by traditional industries. These substitutions focused on business-to-business and business-to-consumer transactions. For instance, many retail sales of books through Amazon.com substitute for bookstore sales. In order to avoid counting those sales as new economic activity, the model assumed two levels of substitution. In the first, all business transactions, and half of the content created for Internets and corporate Intranets, were substitutes for existing economic activity. In the second, half of the transactions and half of the content created for Internets and Intranets were substitutes. This approach to adjusting for substitution effects was retained in estimating the Internet’s employment impacts.

This approach for analyzing the Internet differs in several ways from traditional analysis of the communications services industry. First, many of the differences in the Internet’s impact are due to the fact that, as a consequence of the convergence of computing and communications, far more computing equipment (hardware), software and services are used to create and operate the Internet and corporate Intranets. This is far greater than is the case in traditional phone networks, and it creates an economic impact sharply different from investments in traditional communications infrastructure. In addition, the Internet offers an opportunity for multimedia firms to contribute the content needed for web pages and advertising.

Thus, the Internet stimulates the growth of a group of industries that had not been central to the expansion of traditional communications services. The ESI study developed economic multipliers for the Internet and Intranets, reflecting the connections between those industries and the growth of the Internet. As a result, this study used a multiplier of 3.31 for
the Internet and a multiplier of 4.56 for the Intranets, compared to a multiplier of 2.0 for the traditional telecommunications infrastructure.

The multiplier analysis showed that, after adjusting for substitution effects, the Internet and Intranets, under a high-growth forecast, would account for about 50% of the additional GDP impact of the Internet and wired services in 2000 (due to sales of supplier industries), and they would account for 75% of the additions to GDP in the year 2005. The multiplier impacts, directly linked to the growth of industries supplying the Internet and corporate Intranets, would amount to as much as $99 billion to $110 billion in 2000, and between $462 billion and $541 billion in 2005.

Exhibit B.1: The Contribution of the Internet to U.S. GDP, in Billions of Dollars

<table>
<thead>
<tr>
<th></th>
<th>2000</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NET DIRECT ADDITION</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Modest Internet Growth</td>
<td>$ 3.81 Bil</td>
<td>$ 7.91 Bil</td>
</tr>
<tr>
<td>High Internet Growth</td>
<td>$ 5.51 Bil</td>
<td>$ 19.00 Bil</td>
</tr>
<tr>
<td><strong>GDP MULTIPLIER</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Modest Internet Growth</td>
<td>$ 73 Bil to $ 78 Bil</td>
<td>$ 241 Bil to $ 260 Bil</td>
</tr>
<tr>
<td>High Internet Growth</td>
<td>$ 99 Bil to $110 Bil</td>
<td>$462 Bil to $541 Bil</td>
</tr>
</tbody>
</table>

Note: Direct GDP effects are small because, in the model, much of the direct growth of the Internet replaces expected growth in the wired infrastructure.

About the Authors

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Erik Olbeter returned to the Economic Strategy Institute to direct the Advanced Telecom & Information Technology Program. He focuses on global and domestic telecommunications, technology, and Internet policy. Prior to rejoining ESI, Olbeter served as director of the telecommunications policy program at North Atlantic Research, where he oversaw NAR’s work on many of the same subjects. Olbeter has a Master’s degree in public policy with an emphasis on telecommunications from Georgetown University and a B.A. in economics and political science from Rutgers University.

**Robert B. Cohen, PhD**

Robert Cohen has worked with ESI on a number of telecommunications and Internet studies. He authored ESI’s study on the impact of the Internet on the U.S. economy and earlier had estimated the impact of a more rapid deployment of broadband communications on U.S. GDP and productivity. Dr. Cohen also acts as a consultant on business issues for telecommunications and the Internet. He has developed forecasts for the growth of the Internet and estimates of the size of emerging technology markets. Dr. Cohen recently served as president of the Forecasters Club of New York. He has been a consultant with the Futures Group and the Analytic Sciences Corporation and has taught at the City University of New York and New York University’s School of Business.