

# US Government Information Policy

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July 30, 1997

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\*Presented at Highlands Forum, Department of Defense, June 8, 1997, Washington, DC. Sponsored by the Office of the Assistant Secretary of Defense (Command, Control, Communications and Intelligence). WWW homepages for authors may be found at: <http://www.sims.berkeley.edu/~hal> and <http://www.haas.berkeley.edu/~shapiro>

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## 1 Government information policy

“Government information policy” means different things to different people, so it is important to be clear at the outset about what we mean by it. Broadly speaking, we see information policy as concerned with 3 major areas.

1. Governmental creation and dissemination of information. This includes government funding of research and development efforts, as well as government creation of information such as economic statistics, dissemination of legislation and administrative rulings, cultural materials, and so on. It is important to observe that government policy towards the *creation* of information is distinct from government policy towards the *dissemination* of information once created.
2. Development, regulation, and usage of information infrastructure. This includes issues such as telephony and broadcast regulation, infrastructure for schools and libraries, security and integrity of the infrastructure, and so on.
3. Institutional and legal infrastructure. This includes US participation in international treaties and organizations, privacy rules, antitrust policy, standard settings, contract law, encryption and security, and intellectual property policy.

These categories overlap in places, but we think that they provide a reasonable conceptual framework within which to examine a variety of issues.

## 2 Economic principles

Our premise is that the underlying principles appropriate for government information policy should be the same as the principles appropriate for government policy in general. Hence we begin by describing the principles that we believe should inform overall government policy. Our expertise is in economics, so most of our discussion will be concerned with economic issues. The particular concepts described here will be invoked later in the paper as we examine specific issues, but we illustrate the principles

here with reference to government's role in making the Internet operate effectively.

**Benefits and costs.** Serious attempts should be made to estimate benefits and costs that accrue to various economic and demographic groups as a consequence of potential government policies. Government projects and policies for which aggregate costs exceed aggregate benefits should not be adopted. Projects for which aggregate benefits exceed aggregate costs are candidates for adoption, if a compelling case can be made about why the private sector will not undertake such projects.

Example: ARPA made a decision in the late 70s to fund investment in R&D to develop the Internet protocols. In the mid 80s, the NSF made the initial decision to fund the deployment and operation of the NSFNET. In the mid 90s, the NSF decided that the NSFNET should be privatized.

**Funding.** Selection of funding sources for government initiatives passing the aggregate benefit/cost test should be based on both efficiency and equity considerations. Efficiency calls for groups enjoying the bulk of the benefits to pay at least the incremental cost of the services they receive, and for any taxes imposed to fund government programs to be applied where they will have the least impact on private-sector decisions. Equity considerations tend to call for compensation for groups who bear the bulk of the costs associated with a government policy, or for subsidies to be offered based on need.

Example: Efficient pricing of Internet services requires that prices reflect true incremental costs, e.g., through peak load pricing, and then basing public or private investment decisions for incremental investment on the market value of the services generated by those investments.

**Property rights.** Private sector initiatives are greatly enhanced if property rights are clearly determined. Tragedies of the commons, congestion, and other externalities can be mitigated if property rights are clearly specified and enforced.

Example: For Internet infrastructure, it is important to clearly define and assign property rights to domain names, both to encourage users

to invest in and promote specific addresses, and to prevent costly legal disputes over ownership.

**Right of contract.** Property rights are important, but the right to negotiate away from the default assignment of rights is also of major importance. Voluntary negotiation among individuals with explicit default rules is an excellent way to discover mutual improvements to the default property assignments. In markets for information a great variety of contractual forms may be needed to achieve legitimate business objectives. Only rarely should government restrict the right of contract, e.g., by making certain rights inalienable. Default rights should generally be set to minimize the transactions costs of negotiating away from these defaults.

Example: For Internet commerce to operate effectively, individuals must have the ability to give away or sell the rights to their personal information. This way, individuals can directly benefit by letting vendors know about their preferences so that they can be offered products that they are more likely to buy.

**Externalities and public goods.** Some activities involve *externalities*, which are situations where one individual's choices impose direct benefits ("positive externalities") or costs ("negative externalities") on other individuals. For example, if I broadcast signals on a frequency that you also use, the quality of your transmissions are likely to suffer. In similar fashion, positive externalities arise when one firm is able to imitate another's R&D. In some cases, such externalities may be "internalized" by appropriate assignments of property rights and/or through contract. In the broadcast example, if rights to two neighboring pieces of the spectrum are owned by a single entity, that entity will account for interference between these two pieces of spectrum in its operations. Alternatively, two owners of neighboring spectrum can limit adverse impacts on each other by agreeing to contractual restrictions on the transmissions each of them makes. In other cases, especially when there are many affected parties, contractual solutions to externalities may be impractical, making it attractive to use taxes or subsidies to limit negative externalities or to encourage positive ones.

Example: On the Internet, existing users enjoy positive externalities as others use the network and as more information is posted on-line, but at some point incremental usage can create negative externalities due to congestion, as when servers are too busy to respond or telephone lines are tied up.

**Competition and monopoly.** In the absence of significant externalities, competitive markets can generally be expected to result in efficient outcomes. However, with economies of scale, as often are present in information markets, competition may well lead to a small number of suppliers, or even a monopoly. Monopolized markets are better than no market at all, but may generate inefficient outcomes. The government can play a role in discouraging anti-competitive practices and preventing mergers that reduce competition.

Example: A variety of government entities---including the Federal Communications Commission, the Department of Justice, and state public utility commissions---play active roles in attempting to control monopoly power over the basic telephone infrastructure, both through antitrust and regulatory policies. The Telecommunications Act of 1996 has created an extensive regulatory structure with the goal of prying open local telephone monopolies.

**Privatization and outsourcing** Whether the government actually performs a given function is separate from the question of whether the government supports or mandates that service. Unless there are specific reasons for direct government involvement, such as security concerns, the private sector, which is subject to the discipline of the capital markets, should be used to supply or perform services. In some cases, especially in foreign countries with histories of extensive public-sector involvement in commercial activities, this principle calls for privatization of various infrastructure assets. In the US, this principle typically comes into play in decisions to outsource functions to the private sector. In either case, competition within the private sector, either in the actual provision of a service, or at least in bidding to become the sole contractor, is preferable to monopoly.

Example: The day-to-day operation of the NSFNET was managed by Merit for several years. In the last 4 years of the NSFNET, Merit subcontracted many aspects of operation to a private firm, ANS.

**International Trade and Investment** Economic growth and efficiency are generally promoted by policies that encourage the free flow of goods and services, information, and investments across national boundaries. Foreign countries, and especially net importers of information, should be encouraged to respect intellectual property rights. Absent compelling national interests, US firms should be free to make foreign investments, and foreign firms should be permitted to invest in the US. The US should, however, use access to the attractive US market as a bargaining chip in gaining access to foreign markets that are protected by trade barriers.

Example: The US is moving to permit greater foreign ownership of domestic telecommunications companies, so long as the host country of the foreign firm making the investment itself permits such investments. Such reciprocity, which also has worked well in the airline industry, can help liberalize foreign telecommunications markets, which generally serves US interests. However, the promise by a foreign government to permit outside investments in its PTT is not meaningful absent real privatization.

### **3 Government creation of information**

As dictated by our general principles, the government should not be involved in the creation of information unless (a) the information generates positive externalities, (b) private production of the information would occur under monopolized conditions, or (c) the government is likely to be especially efficient at producing the information in question. Even these conditions are not sufficient to justify government involvement; they are merely necessary.

#### **3.1 Information as a public good**

The unique nature of information as an economic good has been recognized by many observers. The key aspect of information for the purposes of economic analysis is that information is costly to produce, but very cheap to reproduce, especially digital form. This property suggests that efficiency is served by making information freely available. But this begs the question

of who will pay for the information in the first place, and what information is worth producing to begin with.

Information is sometimes said to be a “public good.” Strictly speaking, this is inaccurate, and for an important reason. A public good has two properties: (1) one person using it does not prevent another also from doing so; and (2) no one can (easily) be excluded from using it. Information that is easy to replicate has the first property. Information typically does *not* have the second property, although this depends upon technological and social conditions. For example, satellite broadcasts are encrypted to exclude would-be recipients who have not paid to receive them. Likewise, e-mail that is encrypted so that it can only be decrypted by its intended readers is “excludable” information. Legal rules also determine whether certain information can be kept from those who do not pay for it. Text that is copyrighted may not be reproduced without appropriate compensation to the copyright holder, so it is excludable by law. Of course, such exclusion can never be absolute, because of the costs borne by the copyright holder in enforcing its intellectual property rights.

Since information typically can be copied at minimal cost, especially in a digital world, the creation and dissemination of information tends to be subject to strong economies of scale: cost per user declines with the number of users of the information. As a general principle, the presence of strong economies of scale implies that a single supplier may dominate the market: there is a danger of monopoly, at least in the narrow sense of “monopoly” over specific pieces of information. In many information and entertainment markets, many providers of distinct and unique information compete; this markets structure, known as “monopolistic competition,” prevails in the movie industry, the recording industry, and the publishing industry.

The fact that information has *some* of the characteristics of a public good, and is subject to strong economies of scale, has led various observers to argue that the government should produce, or at least subsidize, the creation of information. “Information wants to be free” . . . but, alas, it isn’t. Someone must cover the cost of production and it is often more expensive for the government to do that than the private sector. The relevant consideration is whether the benefits minus costs of public production are substantially larger than the benefits minus costs of private production.

### **3.2 Government vs. private creation of information**

Three factors are central in assessing whether government or private creation of a specific type of information is preferable.

First, we must recognize that financing government production of information often involves the use of tax revenues. This factor tends to tip the scales towards private rather than government financing of the creation of information. Since the costs of government activities are typically covered by taxes on private activities, a dollar raised by taxation is more costly (from a social viewpoint) than a dollar spent by a private firm, since the dollars raised by taxation tend to discourage other economic activities. It follows that the estimated benefits of government activities should be substantially greater than the estimated costs in order to pass an appropriate benefit/cost test. Browning [1976] estimates that a dollar raised by distortionary taxation has a social cost of \$1.09--\$1.16. Hence, government expenditures must be at least 9-16 percent more valuable than private expenditures in order to increase net welfare.

Second, private production of information may involve monopoly power. Ironically, at least some amount of market power is necessary if private production of information is to be profitable. This factor favors government involvement, since (holding aside information that must be kept secret for security purposes) information produced or controlled by the government is likely to be disseminated more widely than privately-controlled information. Since information is costly to produce but very inexpensive to reproduce, private information providers, in seeking to recover their fixed costs of creating the information, typically will charge well above incremental cost when selling the information. These charges will deter some potential users from acquiring the information, and thus inefficiently restrict dissemination. In principle, the government can avoid this inefficiency by distributing the information freely; we discuss dissemination policies below.

Third, there are cases where government agencies have natural cost advantages in producing information. This most often occurs when the government is reporting on its own activities, or when valuable information is a byproduct of government law enforcement activities. In economic terms, there are economies of scope between the government's primary activities and the creation and dissemination of certain information. For example, the SEC has become a very valuable source of financial informa-

tion, and the PTO offers a wealth of information about patents. Likewise, the reporting of court decisions, legislation, or administrative rulings may be most effectively done by the government.

### 3.3 When government creation of information is desirable

Basic research is an example where government production or subsidization may be warranted based on public-good considerations. Research into, say, cosmology, may not be undertaken by the private sector, but may well be socially valuable. The population may, in aggregate, be willing to underwrite such research, even though it has few immediate applications.

It is important to recognize that basic research may easily have practical payoffs down the road. The whole framework for modern encryption technology, which plays a significant role in secure Internet commerce, is built on research into factorization of prime numbers---at one time thought to be an entirely esoteric line of research. Basic research produces *ideas*, and ideas are, by their nature, difficult to appropriate. This is to be distinguished from applied research, where the patent system allows for appropriability for some period of time. This temporary monopoly granted by the patent system provides significant incentives for applied R&D; however, since ideas cannot be patented, this private incentive is not available for basic research.

According to Broad [1997] and Narin et al. [1997], 73.3 percent of the citations to science papers in patents issued in 1988 were to work done at public institutions in the US (43.9%) and abroad (29.4%). Only 20.4 percent were to papers from American industry and 6.3 percent were papers from foreign industry. According to Narin et al. [1997], "Regardless of how the data are arranged, it is quite clear that public science plays an overwhelming role in the science base of US industry." The vast majority of this "public science" is funded by government agencies.

There are cases where the government has a natural cost advantage in production of information, in the sense that it is more efficient for the government to produce the information than for any other party to do so. This occurs most often when the creation of the information production is a byproduct of other government activities. Databases of government records such as national economic statistics, legislative records, court decisions, etc. are examples. Once such information has been created,

it makes sense to make it publicly available via, say, online publication. With such widespread dissemination, private companies will not waste their resources duplicating government efforts. Instead, producers in the private sector can add value to the raw government information by re-packaging it, re-organizing it, or providing commentary on it.

### **3.4 When government creation of information is not desirable**

Research that is directly appropriable via the existing system of intellectual property protection is probably not appropriate for government subsidization.

As we have seen the patent system already provides incentives for such research by private parties. In addition, private parties often can appropriate the benefits of their research through other mechanisms, such as time-to-market advantages, trade secrets, and by protecting valuable know-how. Indeed, recent studies have indicated that in many industries, patents are relatively unimportant in offering rewards to innovation. See Levin and Winter [1987] and Cohen et al. [1997].

Unless the government enjoys a clear cost advantage, as with information that is a byproduct of government operations, government production of information that competes directly with private information production is not a good idea. If the private sector is willing to produce certain kinds of information, why should the government do so? Government policy would be better oriented towards encouraging competition in information provision via the private sector rather than replacing private sector activity through its own actions.

Of course, there are cases where “natural monopoly” arguments indicate that a single provider of information is warranted by cost considerations. Many broad economic statistics are collected by the government, and appropriately so. It would be rather silly to have several private firms independently collecting data on, say, unemployment rates. However, other sorts of data are industry specific, such as financial data, are readily available through many private and industry sources, so it makes little sense for the government compete in providing such information.

Benson [1997] describes an illustrative example of these issues. The State of California has been putting state information online involving

legislation, lobbyist records, physician records, and so on. Next year they are required by law to put the entire California Code of Regulations online.

This information provision competes directly with private firms that provide governmental information. However, the good news is that the private firms are having to provide value-added services to keep their customers happy:

“ . . . as government gets in the business of serving up its own information, private enterprises are being forced to reinvent themselves---revising, improving, and expanding their services to maintain their appeal.

For example, Legi-Tech [a private firm] recently enhanced its bill-tracking service to provide a summary of every measure in clear, layman’s language. The Senate’s service, by contrast, presents only the text of the bill with no user-friendly interpretation.

Furthermore, Legi-Tech provides a range of ways to find a bill, including allowing searches by author, date of introduction, status in the legislative process, section or code of law it would amend, or any combination of these approaches. The Senate site allows searches by subject and bill number only. And Legi-Tech offers 24-hour customer service, so lobbyists can always get what they need even if their Internet server crashes.

“We want to differentiate our product from the public-domain product, so people can make a choice of whether to use a free service or a paid service,” says Francis Bremson, Legi-Tech’s director of marketing and sales. “The data is the data. We believe the difference is the accuracy, timeliness, ease of use and search, and other feature capabilities we can provide.”  
(Benson [1997])

The article goes on to cite several other examples of information intermediaries who are providing value-added services to the state data. This example is a good model for government information provision: the government has a cost advantage (and a public responsibility) to provide basic information it collects on a “wholesale” basis to the public. This information can be further enhanced by competitive private firms. The

government should not see itself as a competitor with the private sector, but as a supplier---just like the normal wholesale/retail relationship. The appropriate policy shouldn't preclude public direct access to no-frills governmental data; but it should make sure that a healthy private sector exists which can add value to government data.

## **4 Government dissemination of information**

Once information has been created, it is typically quite inexpensive to make it available to a wide audience, especially in a digital age. Indeed, *ex post* efficiency in the dissemination of information calls for the information to be made available at incremental cost to all potential users. One advantage of government creation of information noted above is that the government can, in principle, open the information to the public at no cost, something a private party might well not choose to do.

Principle and practice can differ greatly, however. The rosy picture of government agencies creating valuable information and making it available freely to all begs the question of how the government initially finances the creation of this information. Indeed, the government could choose to make information a "profit center" to help finance its other operations. Should basic government functions subsidize information, or the other way around?

If the government could raise tax revenues without distorting economic activity (e.g., by discouraging work and employment through payroll and income taxes), it might make some sense to increase taxes to finance the creation of information, which could then be distributed freely. However, as noted above, government taxes inevitably cause their own inefficiencies. Also, with free dissemination of information, there is no independent test of the value of that information, making it more difficult to determine which types of information are worthy of government funding.

For these reasons, we think the proper and practical approach is for government agencies to charge at least incremental cost, and often more, of those using the information. Recovery of at least incremental costs through user fees reduces the need to raise funds through taxes, and generally insures that those using the information value it sufficiently to justify incurring costs to generate the information. As usual, defining "incremental costs" depends upon the increment. A single user accessing

a government web site imposes tiny extra costs, except perhaps from congestion costs. Setting up the web site involves greater costs, but it may not be cost effective to charge for access to cover these costs. In fact, we are not advocating such fees as a general matter. However, if the government incurs significant additional costs to generate more accurate or timely information for use by private parties, we would advocate charging the cover those costs, so long as the administrative costs involved in setting up a collection mechanism are not large relative to the anticipated revenue stream.<sup>1</sup> We would not rule out using certain information as a “profit center,” if the demand for that information inelastic, making this information a better source of government funding than general taxes, but we are wary that this approach may be overused.

Fortunately, there often is a way to structure dissemination policies to simultaneously generate funds to finance the creation of the information and encourage widespread use of the information: differential pricing for access to information to different users, or to users seeking different packages of information, e.g., in terms of accuracy, completeness, or timeliness. For example, commercial interests may want immediate access to weather satellite photos while scientists are primarily interested in historical datasets; charging a premium price for immediate access may help to generate revenues that can be used to provide subsequent broader access. See Varian [1985, 1996a] for further discussion of differential pricing; we return to this topic on page 40.

## 4.1 Privatization and outsourcing

Nothing we have said should be taken to indicate that the government must undertake the actual production of information itself. It is often more efficient to outsource the actual production to the private sector. Indeed, the vast bulk of government funded basic research is done by third parties, and the government employs private firms to help collect basic statistical information. The Pentagon, with its extensive contractor relationships, is clearly no stranger to outsourcing.

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<sup>1</sup>OMB Circular A-130 requires that federal agencies provide government produced data at incremental cost; it is unclear to us whether this includes cost-recovery for fixed costs or not. In any event, we believe government pricing of information should not preclude some variation in prices across purchaser categories and data formats.

Such outsourcing provides some of the benefits of competition. Independent contractors who bid for the right to produce various forms of information will likely perform better than producers who have to labor under bureaucratic, and sometimes underfunded, conditions. Furthermore, by outsourcing the production of different information to different vendors, the government can compare their performance and weed out those private contractors who are slow, have high error rates, or have a relatively poor track record.

We see two major limits to outsourcing of information production and dissemination. First, the government may be better at keeping the information out of the wrong hands. For example, we would not recommend privatizing intelligence gathering activities! There may also be problems with outsourcing various information service functions, such as those performed by the Internal Revenue Service or the Social Security Administration, due to privacy considerations.

## **5 Network infrastructure**

Information technology often involves significant externalities. For example, the value of a fax machine to a user is likely to depend on how many people he or she is able to send faxes to. Similarly, the value of an Internet connection may depend on how many people are already connected to the Internet. (See Katz and Shapiro [1994] and Economides [1996] for surveys of network externalities.)

Such goods tend to exhibit a development path characterized by “critical mass.” There is a long, slow increase in their use until some critical mass is reached; after that, the growth rate explodes. Figure 1 (taken from Economides and Himmelberg [1995]) depicts the shipment of fax machines; before 1985 virtually no one had fax machines; after 1989 they were widespread. The explosion in growth took only two years. Video machines, email, the Web, and other sorts of network goods exhibit similar growth patterns.

### **5.1 The government’s role in achieving critical mass**

Once “network goods” obtain sufficiently wide use, the market may be an effective way to provide them. However, there may be a government

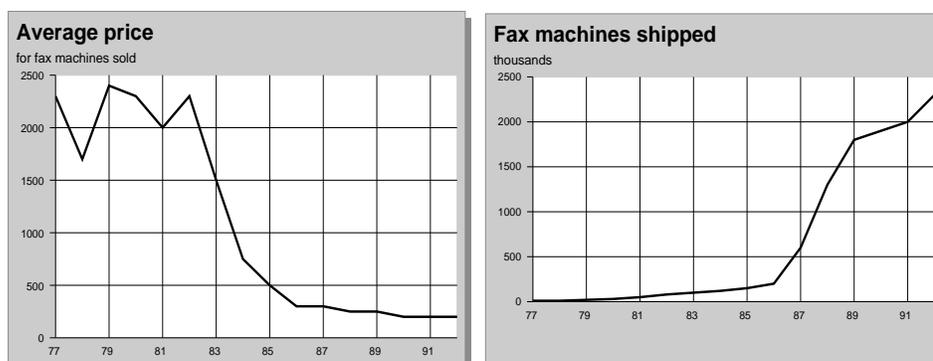


Figure 1: Price and shipments of fax machines.

role in helping such industries obtain critical mass. The Internet is a prime example. It is unlikely that the Internet would have achieved its current level of popularity without early subsidization by the government.<sup>2</sup> This suggests that “demonstration projects” that help an industry achieve critical mass can, in some cases, be worthwhile. For example, proposals for Next Generation Internet and/or Internet 2 warrant careful examination.<sup>3</sup>

On the other hand, one should not underestimate the ingenuity of the private sector in dealing with network externalities. Many highly successful technologies would not have been viable had the private sector not been able to achieve the necessary coordination to build critical mass. In the consumer electronics area, the private sector regularly organizes itself to solve “chicken and egg” problems. Video cassettes and video players are strong complements and are subject to indirect network effects: the demand for video machines depends on the availability of video cassettes and vice versa. In the early 80s, private video rental stores managed to achieve critical mass by renting video machines along with the cassettes. This allowed the video stores to achieve sufficient market penetration to stimulate the demand for the purchase of video machines. Similar factors arise for video game machines, compact disk players, and the new digital video disk players. There are strong incentives for private parties

<sup>2</sup>Of course, it is possible to argue the reverse case as well: governmental provision of network access could have *inhibited* private investment via “unfair competition.”

<sup>3</sup>Disclaimer: Hal Varian is an (unpaid) member of the Advisory Board for Internet 2.

to internalize network externalities, either through integration (as when Nintendo sold an entire system, consisting of a machine and proprietary games) or contract (as when Sony and Philips agreed to license their CD technology widely to get the CD bandwagon rolling).

Thus, we see a government role primarily in cases where network externalities are difficult to internalize, as when basic technology must be proven or demonstrated. We also see an important role for the government as a large, and perhaps pivotal, user of new technologies. The government, in lending its support to particular technology or standard, can and should take into account private interests, not merely its own interests as a consumer of technology.

## 5.2 Universal service

Since the value of the network depends on the total number of people connected to it, one often hears arguments that network goods should be universally provided. The mantra of “universal service” has long been part of telecommunications policy, and there are those that argue that universal service is an appropriate public policy goal for Internet access.

Although we think that widespread availability may be desirable for certain kinds of networked goods, it is a large leap to say that such access will only occur with government provision or subsidies. After all, many goods with network externalities are provided by the private sector, including our original example, fax machines, and the video player/cassette market discussed above.

Basic telephony service has long been regarded as a good that required a deliberate policy effort to achieve universal access. However, a close reading of history raises doubts. According to Mueller [1996], penetration of basic telephony services could easily be comparable to today’s rates, even if there had been no policies of subsidized access. Various comments to the FCC in their recent docket on universal service reform indicated that the current structure of pricing in telephony is costing the US billions of dollars in deadweight losses, with very little impact on penetration rates for basic telephone service. These deadweight losses arise because the prices of elastically demanded services like long-distance calling are set well above cost, and the prices of inelastically demanded services, like basic service, are often below cost, in direct violation of the economic

principles of efficient pricing to cover joint and common costs (“Ramsey pricing”).

Advocates of universal service for Internet or telephony typically make their case on grounds of geography or of income. One can well see why interested parties might argue for geographic subsidization: economic theory suggests that most of the benefits of providing services to isolated area will be captured by those who own land in those areas. Land with electricity service, telephone service and road service is certainly more valuable than land with none of these features, and it is, of course, appealing to those who own the land to have someone else pay for such improvements.

What is forgotten in this discussion is that those who live in rural areas have many advantages over urban dwellers. Crime rates are lower, housing is cheaper, and parking is inexpensive. What is the point of charging urbanites a price higher than cost for telephony service in order to subsidize access by rural dwellers, if all these other “inequities” persist? Overall, it makes more sense to have people face the true cost of their location decisions: if choosing clean air and low crime carries with it a higher cost of telephony service, so be it.

The case with respect to income is not so clear cut. Economists use the term “merit goods” to designate certain goods that are so important that they should be provided to everyone. However, we think that basic necessities such as food, shelter, and health care are much better candidates for merit goods than telephone service or Internet access. In any event, if universal service subsidies are to be provided, they should be limited to those with low incomes and to services that have been demonstrated to generate significant network externalities. Even if basic telephone service meets this test second lines, for example, would not. Even though each of us has several lines in our homes, we are pleased to see that the FCC recently made moves to raise the price of second lines (and business lines) closer to cost.

It is also important to understand clearly the reasons that the poor do not have access to goods such as telephone service. Mueller and Schement [1996] found that a higher fraction of households below the poverty line in Camden, NJ had video machines than had telephones. The most important reasons that people chose not to have telephones was that their friends and relatives would make long-distance calls and stick them with the bill! The monthly charge for basic access was not a significant factor in their

choice of whether or not to purchase telephone service.

What about libraries and schools? These institutions are often singled out as being especially worthy to receive subsidized access to the Internet. We don't see much merit in such subsidies: a poor school would probably be better off with improved facilities and books in the school library, and a rich school can afford to pay for such access itself. In general, local schools and libraries are in a better position to determine their own priorities and needs than are bureaucrats.

Andrew Carnegie provided funds to *build* local public libraries; he explicitly did not provide funds to *operate* such libraries. His argument was that if the users did not value the services of the libraries enough to pay for them, they didn't deserve them. This suggests that *if* subsidization of Internet access to, say, public libraries is viewed as a significant policy goal---a big if, in our opinion---the right way to provide such access is via matching grants. That way, the money will tend to go to the places where Internet access is valued most highly. One could use a sliding scale of matching rates based on local incomes if it was deemed appropriate to control for different incomes.

## **6 Intellectual property infrastructure**

One of the most fundamental roles of the government is to provide a legal infrastructure to produce and interpret the law. In terms of information economics, much of this law is devoted to defining intellectual property rights and elucidating the terms and conditions under which they may be traded.

There are two legal traditions with respect to intellectual property: the economic benefit/cost approach, which compares the benefits and costs of different legal regimes, and the "author's rights" approach, which tries to assign rights to creators of intellectual property in a fair and equitable manner. Not surprisingly we come down firmly on the side of the benefit/cost calculation. Not only is it cited in the US Constitution as the motivation for patents and copyrights, but, unlike the author's rights approach, it provides a coherent intellectual foundation for extensions and modifications of intellectual property law. The authors' rights approach plays a larger role in European law, which is one factor contributing to the difficulty of harmonizing international copyright law.

## 6.1 Patents

Let us consider first the case of patents. A patent grants monopoly rights for a limited time period in exchange for public disclosure of an invention. The monopoly rights impose some deadweight costs on society; the disclosure of the invention, and the production and consumption of the invention, generate some benefits on society. The stronger the rights of the patent holder, the greater the losses from monopoly, but the greater the incentive to invent.

This tradeoff of benefits and costs suggests that there is some optimal extent of patent rights. We consider here three primary dimensions of patent rights:

**Patent length:** How long does the patent last?

**Patent breadth:** How much technology is covered by the patent?

**Patent height:** How original must an innovation be in order to qualify for patent protection?

Patent length was investigated by Nordhaus [1969] some thirty years ago. Under his assumptions, a patent life of 20 years or so did not appear unreasonable. Recently, pursuant to agreements in the Uruguay round of GATT negotiations, patent lifetimes in the US were set at twenty years after the date of filing. Previously, US patents had lasted until 17 years after the date of issuance.

Patent breadth is a day-to-day issue, as applicants seek to have broad claims approved by the Patent and Trademark Office (PTO). In considering the tradeoff between length and breadth, Gilbert and Shapiro [1990] describe a model under which the optimal policy involves long-lived, but narrow, patents, not unlike the protection offered to trade secrets; Klemperer [1990] provides a related analysis of this issue. However, these models do not account for the possibility that a patent may come to control a larger and larger portion of economic activity due to subsequent inventions. Patent breadth also arises in the intersection between intellectual property law and antitrust law, which determines the limits on a patentee's licensing practices.<sup>4</sup>

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<sup>4</sup>See Gilbert and Shapiro [1998] for a recent exposition of these issues.

Patent height arises under the “novelty” requirement of patent law: a new invention must be “novel” as well as useful to be granted protection. Raising the novelty bar increases the value of existing patents---which can be marketed in conjunction with minor improvements without infringing on follow-on patents---but may reduce the return to additional R&D, if such research is unlikely to gain intellectual property protection. This is an example of the general principle that stronger intellectual property protection does not necessarily stimulate further innovation, due to the fact that tomorrow’s innovators stand on the shoulders of today’s innovators, and invention can be deterred if they must pay a fee for the boost.

Ideally, patents would provide just enough of a prize to elicit non-duplicative innovative efforts, and be structured to offer that reward with minimal *ex post* inefficiency. Since the value of a patent is first and foremost driven by market conditions, the system works reasonably well. However, the patent system is subject to some well-known imperfections.

First, the patent system inherently cannot determine whether or not a given invention would soon have been discovered by others, in which case the proper reward is small, reflecting only the slightly earlier discovery due to the winner of the race. In other words, the patent system sets up a race, which can cause firms to devote more resources to speeding up their discoveries than would be justified by a benefit/cost test. Suppose, for example, that a number of research teams were on the verge of making an important discovery, perhaps one that was the next logical step along a well-known research path. Granting the winning team long-term exclusive rights merely because they were slightly faster than others to make a discovery could well create more monopoly power than was necessary to elicit the innovative effort, and slow down future invention as well.

However, there are equally compelling reasons to believe that the patent system often provides smaller rewards for innovators than would be fully efficient. This occurs because patent holders typically generate substantial positive externalities, since many others benefit from their discoveries. Examples of such beneficiaries include: (a) imitators; (b) customers; (c) licensees; (d) future inventors and their customers; and (e) those using the patented invention after the patent expires. As we noted above, inventions generating especially large positive externalities, such as basic research discoveries, are good candidates for government-funded research projects.

These sorts of benefit-cost considerations give one a principled way to examine intellectual property policy. Take, for example, the case of software patents. Up until recently, the Patent Office and the courts interpreted algorithms as “mathematical formulas” which could not be patented. However, in the mid eighties they reversed this policy and began to issue patents for software algorithms. Subsequently the patent office has issued many thousands of software patents.

There are several policy issues raised by software patents. First, up until recently the patent office has not had adequate expertise to evaluate the novelty of submitted patents. This has resulted in ludicrous examples such as the Compton patent on multimedia, the UCSF patent on downloading executable code, or the Software Advertising Corporation’s patent on incorporating advertising into software programs.

Secondly, there is the problem of “submarine patents:” patents that are not publicly available due to the fact that they are under consideration by the Patent Office. In some cases, applicants have allegedly purposely delayed their applications in order to wait for the market to “mature” so as to maximize the value of their patents, and to let them make improvements before others are apprised of their basic patent. These tactics can distort the returns to patent holders, frustrate the disclosure of patented inventions, which is a basic *quid pro quo* for patent protection under our patent system, and lead to unnecessary duplication of effort and lawsuits. The recent change in patent lifetime to twenty years after filing has gone a long way to reduce the problem of submarine patents.

Many of these problems are especially severe for software patents. Innovations that are embodied in physical goods can be bought and sold for a listed price on the open market, so there is no uncertainty about the cost of incorporating a new innovation into a product. However, the market for software components is still primitive, so much software is created in house. Thus, one software developer can easily infringe upon another developer’s algorithm, and, after years, find itself in a very vulnerable position if the algorithm ends up being patented.

All these reasons suggest to us that that patents on algorithms should be narrowly interpreted, and subject to high standards of novelty. Davis et al. [1994] also argue that software patents should have a shorter lifespan than other types of patents. Each of these policies should be carefully considered. As a practical matter, it would be far easier for the PTO to set high novelty standards and grant narrow software patents than

for Congress to selectively alter patent lifetimes for software patents. Furthermore, in many cases the patent lifetime is unimportant, because the pace of progress is great enough that the patent has lost all of its value by its expiration date.

## 6.2 Copyright

Copyright is something of a mystery from an economic point of view. The law is a peculiar mishmash of benefit/cost analysis and author's rights. The current life of a copyright---50 years after an author's death, and 75 years after first publication for works-for-hire---is peculiar from an economic standpoint, once one observes that the present value of a dollar 50 years from now at a 10% interest rate is less than one cent.

The value of copyright payments 50 years in the future are so tiny, that it would hardly be worth anyone's effort to negotiate over them. But in fact, the period of copyright has been steadily increased from 28 years during 1904--63, to 75 years during 1964-77, to 50 years after the death of the author today. The reason for this anomaly is that each time the copyright period was extended, existing works had their life extended as well. In retrospect it would have been sensible to fix the copyright period for a given work at the time of creation and not extend the period for existing works. This would likely have resulted in a copyright lifetime that would be more sensible from an economic point of view. However, it is worth noting that the US has been an exporter of copyrighted materials for decades, thus creating an incentive in the US to extend the rights of existing copyright holders to gain bargaining power over other countries. Typically, attempts to harmonize international copyright laws have ended up settling on the most restrictive practices under negotiation.

The Internet offers two challenges to existing copyright: the fact that it is trivial to copy digital works, and the fact that these works can be inexpensively transferred to other users.

There are technologies that can address the first problem. Essentially they work by encrypting the content, and decrypting it only when payment is received. There are a variety of schemes for accomplishing this going under the names of cryptographic envelopes, superdistribution, cryptolopes, etc.

The difficulty is that these technologies only solve half the problem.

Once the content is decrypted it can still be transferred around the world costlessly. Even if Michael Jackson's latest CD is copy protected, nothing stops a user from holding a microphone in front of his speakers and creating a digital tape that can then be transferred via the Internet.

The mitigating factor is that anyone who wants to sell pirated content has to let potential customers know that such items are for sale and how to find them. And this publicity runs the risk of letting law enforcement agencies discover the operation. The same story applies to the sale of any other illicit items: you have to advertise to sell, but such ads increase the probability of detection.

The 1995 Lehman report on "Intellectual Property and the National Information Infrastructure," suggested that Internet Service Providers should bear liability for copyright infringement that occurs using their services. Naturally enough, the ISP industry was horrified by this proposal. As one concerned party indicated:

"CIX members transmit nearly half a billion messages each day, and cannot realistically be expected to monitor the content of those transmissions. Moreover, the instantaneous nature of digital communications precludes access providers from viewing, judging, monitoring or editing the content of most messages posted or accessed by their subscribers. Finally, IAPs are similar to common carriers in that they have no control over which members of the public use their facilities or the content members of the public choose to transmit.<sup>5</sup>"

Economic theory tells us that liability should be placed where enforcement costs are least. At first glance, it might appear that this principle would support the view that ISPs should be liable for copyright infringement, since ISPs appear to be well-placed to detect copyright violations. However, as the above quote illustrates, strict liability for ISPs could be quite costly. Proponents of liability for ISPs may be thinking more about "deep pockets" than about "least-cost enforcement."

However, a less stringent form of liability might be palatable. For example, there might be a "due care" standard which indicated that as long as the ISP exercised due care with respect to certain limited sorts of

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<sup>5</sup>[http://www.eff.org/pub/Intellectual\\_Property/cix\\_ipwg\\_paper.comments](http://www.eff.org/pub/Intellectual_Property/cix_ipwg_paper.comments)

information (e.g., static disk files available for distribution) there would be no liability for copyright infringement using its services.

Recent technical advances in detecting copies such as SCAM provide low-cost, efficient mechanisms that should not be onerous from the viewpoint of ISPs. Clearly there will be further technological advances on ways to both detect and avoid detection of copies. Setting a fairly minimalist level of due care could provide an effective way to control copyright violations.

There have been several proposals that information about copyright be embedded in document headers. This would make it very easy to verify legitimacy, as long as header information remained intact. Clearly, one would have to have legal restrictions on removing copyright headers from a document to make this an effective strategy. Secure devices could use the information in headers to offer assurances that the content is legitimate and that appropriate compensation has been paid to the providers of the copyrighted material.

### **6.3 Copyright and marketing**

There is some historical evidence that producers of intellectual property may desire laws that are too restrictive for their own good. For example, English publishers were opposed to the spread of libraries in the 1800s:

“. . . when circulating libraries were first opened, the book-sellers were much alarmed; and their rapid increase added to their fears, and led them to think that the sale of books would be much diminished by such libraries.” (Knight [1854])

However, in the long run the spread of these libraries was very beneficial to the publishing industry:

But experience has proved that the sale of books, so far from being diminished by [the circulating libraries], has been greatly promoted; and from these repositories many thousand of families have been cheaply supplied with books, by which the taste of reading has become more general, and thousand of books are purchased each year by such as have first borrowed them at those libraries, and after reading, approving of them, have become purchasers. (Knight [1854])

Two hundred years later, the same story was played out with Hollywood and video rental stores. (Lardner [1987]) Hollywood tried a variety of licensing schemes to prevent video rental stores from purchasing tapes and then renting them to the general public. These schemes all failed, and the failure ended up much to the benefit of the movie industry. Nowadays, Hollywood makes 3 times much money from home video as from traditional distribution. In 1996, consumers spent \$9.2 billion on rental and \$7.3 billion on purchase of videos. (Varian and Roehl [1996])

These considerations give reasons to be careful about providing copyright protection that is too strong. There are many ways to recover costs through pricing strategies that do not impede the (relatively) free flow of information. For example, it has become common to sell software via site licenses; in most cases this is preferable to pay-per-user for both the seller and the buyer of software.

Similarly, academic journals have one price for libraries and one price for individual users. The library price presumably reflects the fact that multiple users have access to the journal. Recently there has been considerable confusion about the rights to photocopy library material. In *American Geophysical Union v Texaco*, the court held that Texaco employees could not photocopy articles from journals to which the Texaco library subscribed. Texaco now pays one fee for subscribing and another fee for the right to photocopy. With this legal clarification, we expect that some publishers will bundle the right to photocopy into the original terms and conditions of journal subscriptions. The court also held that “fair use” should be interpreted differently for educational and profit-seeking ventures. It seems to us that this is not so much a legal issue as a marketing issue---the publisher is free to set different prices for educational and for-profit establishments.

The important issue from the viewpoint of an owner of intellectual property is maximizing the value of his or her property. This may be quite different than maximizing the *protection* of the intellectual property. Creative pricing, marketing, and licensing are likely to yield higher returns than trial lawyers.

## 6.4 Trademark

The Domain Name System (DNS) links up “domain names” such as `info.sims.berkeley.edu` with IP addresses such as `123.45.67.8`. The purpose of this system is to allow users to refer to use meaningful names when referencing Internet sites rather than difficult-to-remember lists of digits. Originally domain names were assigned on a first-come-first-served basis by the Internet Network Information Center (InterNIC) at no cost. By the mid-90s, the size of this task had become quite larger and the InterNIC was allowed to charge a fee to register and maintain names.

One of the problems with the current system of domain name registration is its interaction with trademark law. There can be only one `sun.com` even though Sun Oil and Sun Microsystems might both like that name. Recently, the Internet Ad-Hoc Committee (IAHC) has proposed adding several new top-level extensions (`firm`, `store`, `web`, `arts`, `rec`, `nom` and `info`) to enlarge the set of names available.

Unfortunately, this doesn’t really help much with the trademark problem. Large firms will simply attempt to register their names in all of these top-level domains. It also doesn’t help users find what they want: how do I know whether I am looking for a `firm` or a `store`? A better long-run solution would be to harmonize the top-level domain names with an industrial classification systems such as the Standard Industrial Classification (SIC). This would yield names like `sun.oil-gas` and `sun.computer`, which would allow for harmonization with trademark law *and* would help avoid user confusion.

Difficulties arise with “trademark dilution” for very well-known trademarks (like `disney.com`) but dilution cases could be handled on an ad hoc basis, as they are now.

The other problem would be achieving consensus on appropriate shortened forms of the names and the appropriate granularity. There are 10 top level categories in the SIC codes with about 97 distinct categories at the two-digit level. What is important is that the Internet names map onto the SIC classifications in a reasonable way, not that the mapping be perfect. It also may make more sense to use UN industry classifications in order to encourage international acceptance. Agmon, Halpern, and Paulker [1996] suggest essentially the same idea using the International Trademark Classes defined by the World Intellectual Property Organization (WIPO).

Related problems arise in other aspects of managing the Internet.

Despite the fact that the Internet is highly decentralized, both respect to its technology and its management structure, there are some areas that could qualify as natural monopolies. For example, the Internet Assigned Number Authority (IANA) ensures that each Internet domain has a unique IP address. Although this process can be decentralized to some degree, there should be some final authority for resolving problems. Such an authority would likely have to have some legal standing, which would presumably be backed by the courts. There are other issues, such as the Domain Name System mentioned above, where industry efforts at coordination that arise need to be legitimized by legislation.

Such coordination roles may well involve some degree of monopoly power, though the amounts of money involved are often quite small. Deadweight loss considerations are much less important than quality of service and operations efficiency. One sensible solution is to put the contract out for bid in the same way that local communities contract for trash collection. Tasks such as domain name registration could be divided among a few contractors and their performance could be compared. This kind of “yardstick competition” may help provide efficient and cost-effective service.

## **7 Other legal infrastructure**

### **7.1 Privacy**

The “information revolution” has led to increased concerns about personal privacy, and it is likely that there will be calls for legislation to protect consumer privacy. We think that the primary danger is that that resulting privacy legislation may be too inflexible from the viewpoint of consumer welfare. Congress may be stampeded into inappropriate and inflexible privacy legislation in the same way it has been stampeded into inappropriate and inflexible decency legislation.

The right way to think about privacy, in our opinion, is that it is an externality problem. I may be adversely affected by the way people use information about me and there may be no way that I can easily convey my preferences to these parties. The solution to this externality problem is to assign property rights in information about individuals to those individuals. They can then contract with other parties, such as direct mail

distributors, about how they might use the information.

For example, it is common to see boxes on subscription cards that say “check here if you do not want your name and address redistributed to other parties.” This is a very primitive form of contract. A more interesting contract might be something like: “Check here if you would like your name distributed to other parties who will provide you with information about computer peripherals until 12/31/98. After that, name and address will be destroyed. In exchange you will be paid \$5.00 for each list to whom your name and address is distributed.”

Although it would be hard to fit this sort of contract on a subscription response card, it would be easy to fit it on a Web page. The contract that is being offered implicitly assigns property rights in an individual’s name and address to him or herself, unless the individual chooses to sell, or more specifically, rent, that information.

This particular legal policy seems quite attractive: assign property rights in information about an individual to that individual, but then allow contracts to be written that would allow that information to be used for limited times and specified purposes. In particular, information about an individual could only be used internally for specified purposes, and could not be *resold*, or provided to third parties, without that individual’s explicit agreement.

This idea appears to have been most thoroughly explored by Laudon [1996]. He goes further than simple contracting and suggests that one might sell property rights in personal information on markets. As Laudon points out, there is already a large market in personal information. But the property rights are held by those who collect and compile information about individuals---not by the individuals themselves. These third parties buy and sell information that can impose costs on those individuals, without the individuals being directly involved in the transactions. This is what generates the externality.

Of course, there is some information about individuals that is disclosed to serve a public purpose. Making information available about owners of motor vehicles may help ensure safer operation. Making sales prices of houses available may help ensure the accuracy of tax assessments. My neighbors may care about the assessment of my house, not because they particularly care about *my* tax assessment, but because they care about *their* tax assessment. Such issues must be handled on a case-by-case basis.

If individuals have property rights in information about themselves,

they can choose to disclose it if sufficiently compensated. We think that any new privacy laws should explicitly recognize this sort of contract. If it does not, there will be a long and drawn-out period of confusion about what is and is not appropriate use. If contracts (or markets) are allowed, there will be an initial period of confusion, but we expect that a few standard contractual forms will eventually emerge. We also envision that entities will arise to monitor companies' adherence to their stated privacy policies, i.e., to enforce the contracts for the use of private information.<sup>6</sup> This overall approach, built on the principles of provider notice and customer consent, with third-party monitoring, has been endorsed by the National Telecommunications Information Administration (NTIA)<sup>7</sup>

### 7.1.1 Junk email

One interesting example in this area that has arisen recently is the issue of junk email. Many users have complained about bulk mailings of email advertisements and there have been calls to "do something." One proposed bill, S.771, requires, among other things, that (1) email advertisements be specifically labeled as such, (2) valid address information of the advertiser be included in the message, (3) ISPs provide software to block unsolicited ads, and (4) ISPs monitor mailings of their users in sufficient detail to ensure that they comply with these terms. Items (1) and (2) seem to have some merit--it is useful information for people to be able to distinguish ads from other email and to know the source of the advertisement. It can be argued that individuals should have property rights to their own attention, and that others who wish to "intrude" on attention should be explicit about their motivations.

However, (3) and (4) do not seem to us to be appropriate for legislation, since they can easily be handled by contract. If users value filtering services by ISPs, it is certainly in the interest of the ISP to offer such services in order to remain competitive. Users for whom this is not a particularly important issue can choose ISPs that don't offer such monitoring. There is no need to compel actions that would arise naturally through market competition.

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<sup>6</sup>An example is eTrust, <http://www.etrust.org>.

<sup>7</sup>We each prepared papers for the NTIA on privacy issues; see Kattan and Shapiro [1997] and Varian [1996b].

## 7.2 Decency and free speech

There is a significant amount of content on the Internet that may be deemed objectionable by one group or another. The same may be said of your local newsstand or library. There are various procedures and practices in place that limit the extent to which these traditional printed materials can be accessed by minors.

Such institutions do not exist on the Internet, and is easy for minors to view material that many would view as inappropriate. There are several ways one might deal with this problem. The Communications Decency Act of 1995 makes it illegal to transmit “indecent” material on the Internet. The V-chip and the movie rating system allow a central authority to rate content.

However, in our opinion, the most attractive mechanism for the management of content on the Internet is PICS (Platform for Internet Content Selection). (Resnick and Miller [1996].)

PICS is essentially a set of protocols that allow server computers to provide ratings to other computers that request such ratings. Anyone can set themselves up as a “rater:” the Catholic Church, the Boy Scouts, or your local school board. Individual users may request ratings from whomever they see fit.

The beauty of PICS is that allows for content rating without censorship: users are free to pick the rating service that they want. PICS offers such a nice solution to the decency problem that it has attracted widespread industry support. Microsoft Explorer and the IBM Web server currently support the system, and many other vendors have agreed to support it in their next release.

The system is flexible enough that it can solve several other important problems. “Metadata” is data about data. Examples are things like card catalogs in libraries, license servers on LANS . . . or content ratings. The same system that is used to warn users away from “objectionable” material can be used to point out useful or interesting materials. PICS provides a general infrastructure that can be used to support a variety of other applications.

### **7.3 Contract law**

The cornerstones of a capitalist economy are property rights and contracts. The property rights determine the default allocations, and the contracts facilitate mutually advantageous departures from those defaults.

As more and more transactions take place online, more and more issues will arise about the legality of those transactions. Technology is available to provide digital signatures, time-stamping, watermarking, and other sorts of authentication. At the moment, these technologies have dubious legal standing. Is a contract that is “digitally signed” a legitimate contract? Some states have passed laws recognizing the validity of certain forms of digital signatures, but it will become increasingly desirable to have a uniform code of law for digital commerce. This is a very important role for the Federal government, and we would hope to see revisions to the Universal Commercial Code that deal with the problems on online commerce.

### **7.4 Cryptographic policy**

Current US law allows for strong encryption technology domestically, but substantially weaker encryption for material that is exported. The intent of this law is admirable: there are clearly enemies of the US that would benefit from encrypted communication.

However, we believe that the genie is out of the bottle. There are foreign sources for chips and software that provides for strong encryption, and current US policy is only losing business for US industry.

One potential solution is to attempt to move to a two-tiered system with cheap devices that supply weak encryption and expensive devices that supply strong encryption. This is akin to gun control policies that advocate outlawing “Saturday night specials.” It offers some defense against amateur terrorists, but professionals would presumably be able to buy or steal strong encryption devices.

Key escrow is another contentious issue. The US has proposed allowing strong encryption as long as keys are escrowed with the US government. This proposal does not seem popular at the moment. However, most users of encryption do not appreciate the cost of not having an escrow system. What would you do if an important employee encrypted all information using his personal encryption key and then disappeared? Businesses

are used to backing up safe combinations, critical correspondence, and computer files, but it has not yet dawned on some of them that they have to back up cryptographic keys. However, even when they come to better appreciate the importance of such backups, it seems unlikely that businesses will choose the US government as their preferred provider of key escrow services!

## 8 Competition policy

It is widely thought that competition is *necessarily* preferred to monopoly. However, economists recognize that monopoly may be the preferred form of market organization under certain conditions. For example, if the minimum efficient scale of operation is large relative to the overall size of the market a single larger firm may be more cost-effective than several small firms. Under these conditions, supporting several firms is very costly, perhaps more costly than working with a sole supplier. The Defense Department has certainly learned this lesson during the past several years as it has tolerated, and at times encouraged, consolidation of its supplier base.<sup>8</sup>

In the civilian sector, three broad forces serve to discipline monopolists. First, there can be direct government regulation of prices and service quality. This creates its own significant costs, and is used for only a few industries in the US. Second, there is technological change, offering the chance that an innovative newcomer can topple today's monopolist. Third, there is antitrust law, which limits the business strategies and tactics that monopolists can engage in, and prevents consolidations that lead to monopoly.

### 8.1 Government regulation

The US and other developed countries employ a two-prong policy approach to competition policy: direct regulation of industries that are natural monopolies, such as local telephone exchange service, and broad

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<sup>8</sup>See, for example, the "Report of the Defense Science Board Task Force on Antitrust Aspects of Defense Industry Consolidation," April 1994. Carl Shapiro was a member of this Task Force.

rules of conduct to keep unregulated markets as competitive as possible given the scale economies they exhibit.

The big news of the past year or two in regulating the information infrastructure must be the Telecommunications Act of 1996. We heartily endorse Congress's intention to open local telephone markets to competition. The irony behind the Act, however, is that the goal of competition, and thus the demise of regulation, can only be achieved with a massive new set of regulations! Competitive local exchange carriers cannot get a foothold in the market without the cooperation of incumbent carriers in a myriad of ways, from interconnecting to complete calls, to enabling customers to keep their telephone numbers when switching carriers, to leasing pieces of the incumbent's network to would-be competitors.

In our view, government regulators, including the FCC and State public utility commissions, should move aggressively to ensure that the conditions necessary to local telephone competition to flourish are indeed put into place. Competition will create pressures for companies to offer attractive packages of services, from wireless to long-distance to video services. Competition will also accelerate the arrival of new services, such as broadband services or improved Internet access.

We welcome regulatory policies designed to control monopoly pricing, such as traditional rate regulation, and to transform monopoly markets into competitive ones where technology permits. We caution that such a transformation of the telephone industry will take place only very gradually, however, making regulation necessary for many years to come. We also must note that regulation brings its own dangers: a regulatory structure created to control monopoly power can easily be used to serve other purposes, in particular to engage in cross-subsidization. Inevitably, the services that are doing the cross-subsidizing are stifled: long-distance telephone calling has long been subject to such a tax, which is the enemy of efficient transmission of information.

Cable television regulation reveals another set of dangers associated with regulating information industries. In principle, municipal awards of cable franchises should work well, with municipal officials looking out for the interests of subscribers. In practice, the Federal government has become heavily involved, lurching from the 1984 Cable Act, which made it harder for municipalities to control their franchisees or replace them, to the 1992 Cable Act, which instructed the FCC to develop rates for basic cable services. In addition, Congress has imposed "must carry" rules on

cable operators, requiring them to carry certain local television stations (these were recently upheld by the Supreme Court as constitutional), as well as requiring “retransmission consent” by broadcasters before cable operators can carry their programming. In addition, the FCC has imposed limits on how much “affiliated” programming cable operators may carry. These are not unlike the widely criticized “financial syndication rules” that long limited the ability of broadcast networks to take a financial interest in programming.

Regulations like these, which control and circumscribe the vertical relationships between those who produce content and those who distribute it, are increasingly out of place as the distribution of information becomes more and more competitive. Surely, whatever power CBS, NBC, and ABC had in the 1950s has eroded with the arrival of Fox and the many cable networks. Hopefully, whatever monopoly power cable operators enjoyed in the 1980s will erode as direct broadcast satellite becomes a reality and as telephone companies enter into multichannel video distribution. In this setting, regulations on vertical relationships in the information sector may well serve to benefit certain special interests rather than the public interest.

Our rule of thumb for regulation in the information sector is simple: government regulation should focus on controlling genuine monopoly power where it exists. Regulation of basic cable rates by municipalities, or of basic telephone rates by State utility commissions, fit this description. So do rules to force open monopoly markets, such as those required by the Telecommunication Act of 1996 as a quid pro quo for allowing local Bell telephone companies into long distance. But the government should refrain from imposing rules limiting the ways in which companies in the information industry in different markets choose to deal with each other unless these rules have a direct and clear role in limiting horizontal monopoly power.

Government regulators can also take steps to enable new entrants into monopoly markets, by awarding government franchises to new entrants. The FCC took a step in this direction in the early 1980s by setting up two cellular telephone carriers, rather than letting local telephone companies completely control the cellular business. More recently, through the PCS auctions, the FCC has move strongly to inject far more competition into the wireless telephone business. In many cities, several PCS licensees will soon compete against the incumbent cellular providers. FCC policies prohibiting cellular providers from bidding on in-region PCS licenses

helped insure that new competition would truly emerge. Similar issues arise in the awarding of satellite slots for direct broadcast satellite, which is emerging to be a true competitor for cable companies in multichannel video distribution.

## 8.2 Antitrust in information and network industries

Of course, large swaths of the information sector of our economy are subject to little or no regulation of the type just discussed. In these industries, the rules of conduct are set by our basic antitrust laws. The reach of these laws can usefully be broken into three parts, which we discuss in turn.

**Mergers and joint ventures.** Mergers and joint ventures that “may substantially lessen competition” are illegal. The vast majority of mergers are perfectly legal, but mergers involving direct rivals are typically subjected to antitrust review by the Justice Department or the FTC. There is no need for an special provisions to handle mergers in information industries. The antitrust agencies are very sophisticated in their merger reviews, and have developed substantial expertise in many high-tech industries, including telephones, cable television, and computer software and hardware. The agencies recognize that some industries are highly dynamic, making any monopoly power transitory, and are unlikely to challenge mergers in these industries, because of low entry barriers. On the other hand, there is no antitrust immunity for software mergers, and the DOJ and FTC correctly recognize that entry may be difficult due to high consumer switching costs and the intellectual property rights of incumbents. A number of software mergers have been challenged, and either abandoned or modified as a result: Adobe/Aldus in graphics software; Microsoft/Intuit in personal financial software; Silicon Graphics/Alias/Wavefront in high-end software for graphics workstations; Computer Associates/Legent in utility software for IBM mainframes; and Cadence/CCT in electronic design automation software. Government policy is well-developed and on a sound basis in this area.<sup>9</sup>

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<sup>9</sup>Carl Shapiro served as Chief Economist for the Department of Justice during 1995-96.

**Price fixing, standard setting, and interconnection.** Price fixing, i.e., collusion, cartels, and bid-rigging, is *per se* illegal in the US, and can be a criminal violation. This is not controversial. But the limits of this prohibition can be.

In the area of information technology, we are most concerned about actual and perceived limits on firms agreeing to establish product standards. Product standards, interfaces, and compatibility are critical to the efficient flow of information and introduction of information technologies. It would be ironic, and troubling, if the antitrust laws, in the name of protecting competition and consumers, discouraged the creation and adoption of new product and technologies simply because they entail cooperation and agreements among competing firms.

A case in point is the recent formation of IOPS.ORG. This is an industry group of large ISPs who “will focus primarily on resolving and preventing network integrity problems, addressing issues that require technical coordination and technical information-sharing across and among ISPs. These issues include joint problem resolution, technology assessment, and global Internet scaling and integrity.” It is clear that such coordination is necessary in today’s Internet. But could such a coordination organization sometimes act in restraint of trade? That is certainly a possibility; however, at this stage of the Internet’s evolution, we would be very wary about capricious application of antitrust considerations. There should be clear evidence of a “smoking gun” before intervention is warranted.

We know from first-hand experience that many companies are spooked by the antitrust laws, and very wary of agreeing with actual or potential rivals on product specifications or protocols. Inasmuch as these companies may be subjected to private lawsuits, both from aggrieved competitors and from class-action lawyers, with treble-damage claims, this wariness is understandable. We are aware, for example, of an ongoing lawsuit claiming that Sony, Philips, and others violated US antitrust laws by agreeing to establish what we now know of as the compact disk standard. US firms face greater legal exposure in collectively setting product standards than do their foreign counterparts, because the US uniquely permits private antitrust actions combined with class actions and treble damages.

Recent legislation has removed treble damages for certain research and production joint ventures. Further protection for participation in standard-setting activities may well be warranted.<sup>10</sup>

Similar issues arise when firms combine to create a network, such as banks joining to form an ATM network or credit-card network. Although these networks are rarely challenged as naked price fixing, the legal limits on joint action remain a very real question. Rules limiting the addition of new members of the network have been challenged, as in Discover's lawsuit against Visa. (Visa won.) Rules insisting that members not belong to other networks have been blocked, as in the DOJ action against FTD, the floral network, and the European Union's action against Visa striking down their exclusivity rules.

We recognize that a "network" can wield substantial economic power, because consumers may place great value on using the predominant network. Even so, we tend to take the view that a group of firms forming a network has the right to choose with whom they will interconnect and on what terms they do so. We are more skeptical of exclusivity rules that limit network members from participating in other networks, when employed by ventures with significant monopoly power.

**Single-firm conduct.** Mergers, joint ventures, and standard-setting all involve more than one firm. Unilateral conduct can also run afoul of the antitrust laws, if it constitutes "monopolization." The hard part is distinguishing the firm that successfully competes, and thus gains a very large market share, from the firm that somehow crosses the line, and gains a monopoly using tactics that are unfair, inefficient, or harmful to consumers, and thus illegal.

The computer industry has provided the field on which antitrust and high-technology have collided. All during the 1970s, the DOJ fought IBM, only to drop its suit in the early 1980s, even as IBM's power was subsiding due to market forces. During the 1990s, Microsoft has been the test case. Did Microsoft gain its monopoly over desktop operating systems by legitimately competing on the merits,

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<sup>10</sup>See Anton and Yao [1995] and Kattan [1993].

or through anticompetitive tactics? In 1994, the Justice Department concluded that Microsoft had violated the antitrust laws in the way it structured its contracts with computer manufacturers, and Microsoft agreed to modify those contracts. The Microsoft case has evoked a great deal of commentary on both side: those who say antitrust should keep its nose out of the dynamic computer industry, and those who say Microsoft is a dangerous monopolist that got away with a slap on the wrist.

We will hardly resolve the debate over Microsoft here. We believe a cautious approach towards antitrust policy and enforcement is called for in high-technology industries, in part because technological change does tend to erode monopoly power and in part because much of the conduct at issue has at least a tolerable efficiency basis. For example, when Netscape complains that Microsoft will drive Netscape from the market by incorporating its own browser, the Internet Explorer, into Windows, one must ask whether consumers will indeed benefit from a greater integration of the browser and the operating system. In other words, assessing whether practices such as bundling the browser into the operating system are pro- or anti-competitive is difficult, fact-specific, and involves a balancing. We can say no more, except to question whether these disputes are best handled in the courtroom with a lay jury, or through some more sophisticated forum for dispute resolution.

### **8.3 Price discrimination**

Our discussion of antitrust brings up the issue of price discrimination. This is the practice of charging different users different prices for “essentially” the same good. The Robinson-Patman Act, much criticized, says that price discrimination is illegal if it “effectively lessens competition,” and many antitrust cases have been brought on this grounds.

However, the qualifying phrases “lessens competition” is critical. In the case of information goods price discrimination is often benign, and is positively beneficial to groups receiving discounts. Furthermore, price discrimination may be a necessary strategy to recover costs, and thus support the creation of additional content.

Recall that a fundamental characteristic of an information good is that

it has a large “first copy” cost and a very small “incremental copy” cost. It costs millions to create a Steven Spielberg thriller; it costs almost nothing to produce another video tape of this same thriller. The movie industry deals with this problem by selling into several different markets at several different prices: the movie is shown in first-run theaters, hotels and airplanes, pay-per-view, and home video. Within the home video market, there is market segmentation with respect to buyers and renters. And we haven’t even started on the foreign market! Movies are shown abroad at prices that vary from country to country, depending on local customs and incomes.

This sort of differential pricing is what allows Hollywood to recover the immense costs of producing blockbusters in the first place. Other sorts of information vendors have similar strategies: books are issued first in hardback and later in paperback. Software is sold at retail and at site-licensed prices. Online information services like Lexus/Nexus have one price for daytime use and another price for evening use.

In many cases such pricing strategies are essential to cost recovery. Price discrimination itself should not be taken as *prima facie* evidence of anticompetitive behavior. It is true that *in some cases* differential pricing can serve as an anticompetitive strategy, and can be illegal under the widely-criticized Robinson-Patman Act. The critical question is to ask whether differentiating prices allows the producer to sell to markets that otherwise would not be served. In many cases described above, the answer is clearly “yes.” If film producers had to set one price for first-run movies in all countries, only the high-income countries could afford to go to the movies. When they can set high prices for high-income countries and low prices for low-income countries, they are able to serve a whole new class of consumers. (See Varian [1985, 1996a] for a more detailed discussion of the welfare effects of price discrimination.)

It is important to remember that no one has ever made money by pricing a good at more than the market will bear. Since information goods have very low costs of reproduction it is in the interest of the producer to sell them at a very low price to consumers who cannot pay a high price, *as long as such sales do not cut into the demand by the consumers who are willing to pay a high price.*

This means that firms must be able to prevent resale and other sorts of cross market arbitrage. Just as consumers are not allowed to rent a video and charge admission to the public to see it, consumers who purchase

an information good at a low price should not be able to resell it to the high price market. Producers will, of course, attempt to prevent this kind of arbitrage, and our contention is that the antitrust agencies should be amenable to such policies. This may be difficult politically, but vigorous attempts to enforce a “one-price” policy can easily end up having highly perverse outcomes---e.g., raising the price for the very market segments that are least able to pay.

## 8.4 Fraud and security

Our final category of government oversight is with respect to fraud and criminal activity.

Organizations such as the FTC and the SEC play a vital role in assuring truth in advertising, information disclosure, elimination of consumer fraud, and activities designed to maintain consumer confidence in commercial practices. So far as we can tell, these traditional activities will continue to play an important role in the information economy of the future. Government Web sites will help disseminate useful information about firm conduct widely and will help our market economy to function more effectively. EDGAR and Thomas are excellent examples.

The technical and legal infrastructure for online security is still very primitive. The Black Forest Group describes 15 top level security issues for the Internet that require industry-wide international coordination. Among these are an international authentication system, software registry services, public key infrastructure, a network security architecture, etc.

At the least, industry solutions to these issues will require legislative endorsement that sets criminal penalties for misuse. A larger role for the government may be necessary in some cases, especially for issues involving international coordination.

## 9 Government as example

The government is a producer and a consumer of information. Policy with respect to formats for providing information, procurement systems, security standards, and other issues that arise naturally in the conduct of government business can become *de facto* standards simply due to the importance and magnitude of government transactions. When choosing

standards for its own transactions, the government should resist the “not invented here” syndrome and attempt to choose sensible open standards that are already available in the marketplace. If there are no existing standards, the government should recognize that its choices could have significant and widespread implications for other users, and the procedures used to make such choices should take these considerations into account.

The State Department also regularly represents the US in international standard-setting bodies, such as the International Telecommunications Union. Here, we believe the government should go beyond a mere mouthpiece for business interests, and look to establish standards, and policies regarding the use of intellectual property in standard-setting, that benefit users as well as producers of information.

## **10 International trade and investment**

Markets for information tend to be worldwide, because the cost of “transporting” information from one physical location to another has become so small. The US is a strong net exporter of information, both through the licensing of patents and through the export of copyrighted materials. Furthermore, as the international information infrastructure becomes more integrated, there will be more alliances among telecommunications firms, and more direct foreign investment. Each of these factors have raised issues about international aspects of government information policy.

### **10.1 Foreign investment in US telecommunications firms**

We advocate a US information policy that facilitates international trade and investment in these areas, both incoming and outgoing. The US response to foreign investments in our telecommunications firms is a good example. Over the past few years, British Telecom bought a minority ownership in MCI, and now plans to fully acquire MCI to form an international telecommunications giant named Concert. At the same time, France Telecom and Deutsche Telecom have acquired 20% of Sprint. In both of these cases, the initial investments went along with specific plans to offer a range of enhanced services to multinational firms. These investments and efforts to serve multinationals (each of which was subject to modification

by the Justice Department on antitrust grounds) tend further US economic interests.

Generally, the US should welcome foreign investments in our telecommunications companies by foreign telecoms, so long as the foreign country is truly liberalizing its own telecommunications sector and permits reciprocal investments.<sup>11</sup> Among other benefits, international alliances and investments among telecommunications companies can help reduce the price of international calls over the switched network, which have historically been priced far above cost under an inefficient system of international settlements.

The fact is, US multinational corporations form a very attractive market for telecommunications companies worldwide, and our export position will be stronger if the integration of international telecommunications facilities and services is promoted through such investments. At times, it makes good sense to use the attractive US market as a bargaining chip in prying open foreign markets. So, while the UK has moved forward with liberalizing their telecommunications sector, France and Germany are farther behind, which would raise additional issues if France Telecom and Deutsche Telecom were to move to fully acquire Sprint.

## **10.2 International aspects of intellectual property**

The US will continue to be a strong net exporter of knowledge, both in the form of technical information such as patent licenses and computer software, and in the form of copyrighted entertainment materials, such as movies and books. This gives the US a powerful incentive to see that other countries respect the intellectual property rights of US entities. We fully support using various trade policy tools to gain leverage over countries that permit the pirating of US intellectual property. However, we do not support moves to expand intellectual property rights on existing works, e.g., through the extension of copyright lifetimes, in order to improve our terms of trade.

We also would like to raise a warning about “harmonization.” Harmony is a wonderful concept, but on what terms? For example, the European Union generally has a more narrow notion of “fair use” than

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<sup>11</sup>The recent WTO agreement on basic telecommunications services was along these lines, calling for looser limits on foreign ownership on a reciprocal basis.

prevails in the US. We are not convinced that narrowing the fair use doctrine is a move in the right direction merely for the sake of harmonization. The recent discussion at the WIPO in Geneva of the protection afforded to databases illustrates some of these concerns.

Finally, US intellectual property policy should not be driven by international treaty. It is a mistake to rush into ill-advised treaties before the benefits and costs of alternative policies can be carefully analyzed and subjected to domestic public debate.

## **11 Recommendations**

By way of summary, we note some specific recommendations that we have made with respect to information policy.

1. The government should provide information for which it is the most cost-effective producer, taking into account the deadweight loss due to taxation. This information then be further enhanced by private-sector activity. It should not attempt to compete directly with a competitive private sector that enhances government-produced information.
2. The government should continue to fund basic research including research in networks and computer technology to maintain the US technological edge in this area. This includes deployment of demonstration projects.
3. Outsourcing is an attractive strategy for cost reduction.
4. The government should resist calls for universal service subsidies.
5. In cases where a subsidy is deemed appropriate, matching grants are typically to be preferred to lump sum grants.
6. The government should establish and maintain flexible property rights for intellectual property and privacy. There are technologies that allow for content rating without censorship or free speech restrictions.

7. The government should ensure that there is an appropriate legal infrastructure for electronic contracts. Cryptographic policy should not put US information providers at a competitive disadvantage with respect to foreign firms.
8. Information technology is subject to large increasing returns to scale on both the demand and supply side. Market outcomes in such industries will inevitably tend to be somewhat concentrated and require industry standardization and coordination. Antitrust enforcement should reflect this understanding. Government regulation should focus on controlling genuine market power, where it exists.
9. Differential pricing is an effective tool for cost-recovery that arises naturally in industries with large fixed costs and small marginal costs; antitrust policy should not overly discourage its use.
10. The government should recognize that its own choices have an influence on the marketplace, and weight costs and benefits carefully.
11. Other things being equal, international trade in information technology is desirable. The US is well-placed to help encourage other countries to make their markets more competitive.

## **A Omitted topics**

We have omitted several important topics, not because we believe they are irrelevant, but rather because we do not think that we have studied them sufficiently to have developed views that we have confidence in. Among these topics are:

- educational and training policy
- labor market policy
- national security
- macroeconomic, monetary and taxation policy
- jurisdiction, nexus, sovereignty

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