
Introduction

The Half-Life of Policy Rationales: How New Technology Affects Old Policy Issues

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Writers have occasionally noted that a policy's appropriateness depends on the current state of alternative technologies and that technological changes make old policies obsolete and new policies worthwhile (Hayek 1979, 47; Rosen 1992, 68). This book addresses a related question: Does technological advancement generally enhance the case for one kind of policy over another?

The chapters offer a tentative conclusion: *Technological advancement tends to enhance the case for free-enterprise policy*. It reduces the strength of market-failure arguments and the case for intervention. Most market-failure arguments boil down to claims about invisible-hand mechanisms being obstructed by some kind of transaction costs. If technology trims transaction costs—by making it easy to charge users, define and enforce property rights, exit and utilize substitutes, gather information, gain assurance of quality and safety, enter and compete in markets—the invisible hand works better. An example is highways. Using electronic tolling, highway users can now pay highway tolls as easily as they pay a monthly phone bill, weakening the case for operating highways as freeways and strengthening the case for privatization. Technological advancement might not enhance the case for free enterprise in every area of policy, but it does in most.

Before explaining more fully the volume's central themes, it might help to state clearly . . .

What the Book Is Not About

In recent decades technological advancement has accelerated. Writers of diverse perspectives have pondered the effects and speculated on the future course of public policy. Some suggest that new technologies will enhance government power to survey, regulate, and enforce (Brin 1998). Others argue that technology will frustrate government efforts to control behavior and beliefs as technology enables people to circumvent controls (T. Friedman 1999; Gilder 1989, part V; Huber 1996; McKenzie and Lee 1991). It has been argued, for example, that counterdevices such as encryption and reverse surveillance will check government and enable individuals to remain a step ahead (Brin 1998; D. Friedman 1995; Henderson 2000). Thus, many have speculated on the governmental changes that technology *will* bring. But few have explored the changes that it *ought to* bring. This collection suggests that technological advancement ought to persuade policymakers to implement reform in the direction of free enterprise, but it does not predict that public policy will move in that direction. (One may hope that there is a direct connection between the *ought to* and the *will be*, but that hope is so often disappointed!)

The policy areas considered here are traditional ones like parking, postal services, and occupational licensing. The book is not about “technology policy” (taxation and regulation of the Internet commerce, copyright, privacy, encryption, and so on). We ask not how high-tech services should be regulated (a question asked by DeLong and Froomkin 2000) but how new technology ought to affect our thinking about traditional policy areas and whether technological advancement generally favors certain kinds of policy.

The Central Argument: Technology Works to Resolve Market Imperfections

Theories of market failure and governmental remedies are not absolute doctrine but depend on the institutional and technological context.¹ The invisible hand—the nexus of voluntary social mechanisms—may fail, in a significant sense, if transaction costs obstruct gainful exchange. But better technology reduces such costs. Applications of market-failure theory may be found to have a technological “half-life,” after which their validity dissolves. The contributors to this volume suggest that technological advance-

ment tends to enhance the case for free enterprise, first, by resolving apparent market imperfections of various well-known categories—nonexcludability, information and assurance costs, natural monopoly—to which we shall return shortly.

Some would challenge the general claim, arguing that just as technology enhances the knowledge and capabilities of private entrepreneurs, so it enhances those of public-spirited regulators and officials. Government becomes more effective by virtue of technology. No doubt there is much to the challenge. Government agencies, too, can run highways as toll roads. Or consider a common argument against regulation, that it introduces non-compliance problems and requires costly enforcement. Insofar as technology facilitates government monitoring and enforcement, the case for government regulation gains strength.

However, if both free enterprise and the government are technically capable of, say, producing tomatoes, the sheer-incentive argument recommends free enterprise. Good government itself is a public-goods problem (Tullock 1971); government often fails to do the good that it is technically capable of. The free-enterprise system, however, generally creates for its participants incentives to pursue what is good for society. Hence, the incentive advantage recommends free enterprise, given technical and institutional workability.

The Complexity/Unknowability Argument for the Volume's Claim

While admitting some symmetry in the effects of technology, we believe that there is an important asymmetry that goes against government. Any form of government intervention or enterprise depends for its justification on an understanding of what the private-enterprise economy would otherwise be lacking or failing to achieve. Justification for occupational licensing depends on consumers being unable, in a regime without licensing, to obtain quality and safety assurance. Utility regulation depends on theories of natural monopoly. Government activism is predicated on a belief that regulators or planners can *know the economy well enough* to restrict, manipulate, or supplement it beneficially.

After Adam Smith and Friedrich Hayek, the classic argument against government intervention is, aside from incentive problems, that the economy is too complex to know and therefore too complex to direct or

manipulate in a beneficial manner. Like the spontaneous patterns of roller skating in a roller rink, the more complex the system is, the more mischievous the notion of centralized control will be. In a complex system such as that of two hundred skaters in a roller rink, we ought to rely on decentralized decision making. After all, even if the rink is without bound, the increased complexity does not pose a comparable problem for the individual skater. He does not interpret the whole; he utilizes pointed knowledge in pursuing opportunities of his particular time and place.

Technology enhances government's ability to gather, collate, and convey information and to monitor actions, identify transgressions, and enforce compliance. Technology expands the informational capability of government. But technology also accelerates economic change and multiplies the connections between activities. It integrates dimensions, connects multitudinous variables, and, moment by moment, alters constraints and opportunities. To know market arrangements—either those that are current or those that would exist under an alternative policy—the fundamentals of such arrangements would have to remain unchanged for the time being. Technology makes the whole economy—what is to be known—far more complex. It brings fundamental upsets, now and again, to even our best understandings of current arrangements and their shortcomings. After all, society includes the thoughts and potentialities of private individuals and organizations, each of whom has likewise enjoyed vastly expanded informational capabilities.

In his book *The Lexus and the Olive Tree*, Thomas Friedman relates comments from a friend that illustrates the contest between informational capability and complexity. He quotes Leon Cooperman, the former director of research for Goldman, Sachs:

When I joined Goldman Sachs in 1967 . . . I was the head of research and I hired analysts. In those days, a typical analyst covered seventy-five companies. . . . I was recently talking to one of the analysts I had hired back then and he told me he was terribly overworked now because he had to cover twelve companies. I just laughed. Only twelve companies? But you have to look into those twelve companies so much more deeply now in order to get some edge that it takes up all of his time. (Cooperman quoted in Friedman 1999, 101–2)

One might imagine that because of today's high-speed data access, computation, and so on, the analyst would have better informational capabilities, enabling him to cover *more*, rather than fewer, companies. But his in-

formational capabilities do not keep up with the complexity of the world to be analyzed.

In 1879, Cliffe Leslie, an Irish economist and keen expositor of Adam Smith, wrote: “The movement of the economic world has been one from simplicity to complexity, from uniformity to diversity, from unbroken custom to change, and, therefore, from the known to the unknown.”² In later years Friedrich Hayek took the point further: the economic world has moved not merely to the unknown but to the *unknowable*. The effect of technology is asymmetric in the epistemic situations in which it leaves, respectively, private actors versus social planners (such as those at the FDA or the Anti-Trust Division). *Technology’s heightening of society’s complexity outstrips its heightening of the social planner’s informational capabilities.*³ Hayek, like Smith, drew a lesson for policy: Except in the most clear-cut cases of systemic harm, like air pollution, the supposition that government officials can figure out how to improve on the results of decentralized (i.e., voluntary) decision making becomes more and more outlandish. In his Nobel lecture, Hayek (1978) called that supposition the *pretense* of knowledge. As intellectuals who ponder the complex workings of the social world, we really know little aside from one hardy fact: If those who participate in an activity do so voluntarily, each is probably bettering his or her own condition. The more complex the system is, the more skeptical we ought to be about claims to knowledge that go beyond and against that hardy fact.

There are, then, two ways in which technological advancement enhances the case for free enterprise: (1) It reduces the transaction costs that had obstructed (actually or supposedly) invisible-hand mechanisms, and (2) it makes the economic system ever more complex and makes the notion that interventionists can meaningfully know and beneficially manipulate the system ever less credible.

Policy Areas in Which the Conclusion Is Doubtful?

Some cases seem to go against the general tendency. Technology might make it especially difficult to secure and appropriate the value of one’s intellectual products, such as basic scientific research, patents, software, music, and writings, because technology vastly facilitates the replication of “knock-offs” and sharing without authorization. The situation might call for stepped-up government enforcement of patents and copyrights (is that

government intervention or property rights enforcement?) or more interventionist measures like the subsidization of knowledge and cultural products—akin to European television subsidies financed by taxes on television ownership (a policy that DeLong and Froomkin 2000 sometimes seem to favor).

It may be argued that technology favors expanded government control of pollution because it enhances the effectiveness of detection, measurement, impact assessment, and enforcement. The case of auto emissions is considered in the chapter “Fencing the Airshed,” in which it is argued that new sensing technologies offer powerful means of accosting gross-polluting motorists. It is not clear, however, that pollution abatement should be regarded as government intervention. Common law traditionally treated air pollution as a nuisance, and the scheme proposed in that chapter keeps to that spirit. Furthermore, the new technology offers an excellent alternative to many existing interventions. If government uses new technologies to define and enforce property rights in water, airspace, or animal resources, that might be seen as defensive nightwatchman functions compatible with the principles of free enterprise.

National security is another area in which technology might suggest a larger role for government. Capabilities to create advance quickly, but not as quickly as capabilities to destroy. New destructive capabilities in arms, biotechnology, and, eventually, nanotechnology might recommend vigorous national security measures. Again, depending on the measures, we might not deem them “government intervention” but, rather, nightwatchman functions.

Improved technology, as previously mentioned, might improve regulators’ knowledge of particular sets of activities and cause some to recommend more interventions such as antitrust restrictions. Some might even suggest that new technologies will deliver the long-sought means of administering a centrally planned economy: “Indeed, with the development of mathematical programming and high-speed computers, the centralized alternative no longer appears preposterous. After all, it would appear that one could mimic the workings of a decentralized system by an appropriately chosen centralized algorithm” (Arrow 1974, 5). However, again, the growth of the complexity of the whole ought to humble even our latest technologies of knowing and intervening. Even at the level of piecemeal intervention such as antitrust policy, justification relies on a pretense of knowing that such interventions are likely to improve in the whole on what the un-intervened system would produce.

Finally, it might be argued that technology will make government more transparent and hence more accountable. We may put more trust in government because any abuse or outrage will be more readily exposed and investigated (Brin 1998). This optimistic factor surely has some validity. It may be extended: technology will facilitate public discourse, public understanding, and participation in direct democracy. Perhaps government can be made more accountable and reliable through “electronic town meetings,” in which each citizen may delegate his or her voting rights to proxies (as in shareholders’ meetings). If government were thereby improved, the case for activism would be strengthened.

Our conclusion, therefore, makes no claim to entirety or universality. We do not say that technology favors the case for free enterprise in all areas of policy. We thus submit a hypothesis that says “tends to,” “mostly,” “usually,” “in general.”

Arrangement of the Chapters

Each chapter in this book addresses an area of service provision and policy and tells how technological advancement affects the traditional debates in that area. The chapters show how technology weakens specific market-imperfection arguments against free enterprise. Thus, the chapters chiefly elaborate on technology’s ability to reduce transaction costs and enhance competition. Only occasionally do they explicitly develop the complexity/unknowability point, even though it resides implicitly throughout.

Most of the chapters present a central market-imperfection argument to which the author brings new technology to bear. The chapters have been arranged around these central arguments.

Technology Enables Metering, Excluding, and Charging

A nonexcludable public good is one whose benefits cannot be withheld from nonpayers or noncontributors. Because users of the good cannot be made to pay and instead look to free ride, entrepreneurs who supply the good, goes the textbook story, cannot make profits. Hence the free market underprovides the good or service, and arguably, the government ought to levy taxes to finance its provision.

The lighthouse has long served as the classic example of a public good that cannot be supplied by purely voluntary means. Ronald Coase (1974)

explored the history of lighthouse provision in Britain and showed that private entrepreneurs built, owned, and operated lighthouses and made profits. Payments from ships for lighthouses were mandated at nearby ports, however, so, as David Van Zandt (1993) explained, the arrangement depended in such cases, after all, on a form of taxation. Whatever the lessons of the historical experience, the chapter on lighthouses by Fred Foldvary shows that technology has dissolved any argument for government financing of lighthouse services. Because of radar, sonar, satellite-based electronic guidance, and the feasibility of scrambled or encrypted signals, the lighthouse is largely antiquated as a navigational aid. Thus technology has turned the canonical public good into a museum piece.

Governments are actively involved in transportation, but some of the rationales for that involvement, again, have been whittled down by technology. It has traditionally been argued that charging for highway use or parking space would entail significant transaction costs, such as delays and inconvenience for motorists, the handling and securing of bulky cash, and costly or unsightly toll booths or parking meters. Yet these difficulties have been lessened considerably. Peter Samuels describes various systems for electronic toll collection on highways. For parking, Donald Shoup describes similar developments that dispense with on-street parking meters. Such technologies help bring the relevant resource into the fold of market mechanisms and create strong arguments for privatization. Parking spaces along the curb, for instance, could be turned over to adjoining property owners or associations that use new methods of metering and collection. Such an approach would create profit opportunities that elicit supply, discovery, and more efficient resource utilization. Debates over parking and highways involve market-imperfection arguments other than that of exclusion costs, but technology clearly answers the central challenge to private enterprise in these areas.

The foundation for the invisible hand is private property rights. Michael De Alessi explores the ways in which new technologies are enhancing the ability to define, secure, trade, and enforce private property in marine resources. He suggests that the promise of aquaculture and fisheries to feed humankind is like the promise that was the American West. Just as ranchers and cattlemen secured and built up their property using innovations like branding and barbed wire, today entrepreneurs can do likewise in oceans using technologies of livestock herding, "fingerprinting," tagging, sonar, satellite tracking, habitat creation, fencing, gating, and guarding.

Technology has strengthened the intellectual case for aquatic farming and ranching.

Can the virtues of property rights be realized in air resources? Air pollution remains one of the best examples of negative externalities (and pollution prevention one of the most compelling public-goods problems). In the chapter on auto emissions, Daniel Klein argues that the property-rights approach can be applied using sensors (paradoxically called “remote sensors”) that directly measure a vehicle’s on-road emissions. The new technology allows for very easy identification and apprehension of gross polluters. The airshed can be defined as the property of the relevant local governments, which guard against violations. This approach would punish only offenders by, say, imposing fines. The fines would, in a sense, be “charges” or “user fees,” though they would also carry moral disapprobation. Governments could then dispense with many interventions in auto making, fuel usage, driving behavior, and scheduled inspection (“smog checks”). Policing against actual offenses alone would allow and align the invisible hand to keep down auto emissions.

That technology facilitates metering, excluding, and charging figures into several of the other chapters, though less prominently. That technological advancement thus favors free enterprise pertains also to many policy areas not covered here, such as other natural resource, wildlife, and pollution issues, security and firefighting, sanitation, and urban transit. (Highly relevant here is Anderson and Hill’s 2001 valuable collection.)

Technology Facilitates Quality and Safety Assurance

Many “consumer protection” interventions suppose that quality and safety assurance cannot be adequately provided by voluntary practices and the tort system. Consumers suffer from “imperfect” or “asymmetric” information, which makes for transaction costs in marketplace decisions. The cost of overcoming ignorance is high or even insurmountable, and consequently, consumers are vulnerable in a free market to false representations of quality and safety. Services infrequently used or especially hard to understand need to be restricted according to government approvals and permissions. This line of thinking is used to rationalize many government policies and agencies, including the Consumer Product Safety Commission, the Food and Drug Administration, the Securities and Exchange Commission, the National Highway Traffic Safety Administration, the Occupational

Safety and Health Administration, and local and state occupational licensing, business licensing, and housing codes.

As consumers demand assurance, however, voluntary market processes find ways of supplying it. Service providers assure consumers of quality and safety by building and conveying a good reputation. They obtain certifications and seals of approval, seek affiliations with trusted sources, and develop a brand name. Consumers, for their part, also look to rating or recommending agents to ascertain reputations. All these methods and media depend on the generating, collecting, interpreting, formatting, storing, retrieving, and transmitting of information about service providers.

Information technologies are enhancing such methods. Shirley Svorny reexamines the rationales for medical licensing. Computer technology coupled with practice review and monitoring have given hospitals, clinics, health organizations, and insurers new means of evaluating practitioner performance. These institutions function as certifiers. Furthermore, through the Internet and other media, consumers themselves are more able to gain pointed expertise, by learning about available therapies, tapping the knowledge of fellow patients, and checking the credentials and affiliations of practitioners.

John Moorhouse explores the powers of the Internet to provide consumers with both technical knowledge and assurances. He surveys the information resources available from independent organizations, other consumers, and the vendors themselves. While such resources burgeon, entrepreneurs economize on the amount and complexity of information that consumers require. Rating organizations develop a good reputation for conveying accurate assessments of sellers and manufacturers. Using the Net, consumers may look merely for the "thumb's up" (or seal of approval), read detailed reviews, or click to another vendor who provides better assurance.

David Friedman and Kerry Macintosh consider the case against laissez-faire banking. Critics of free banking suggest that the system would be marred by bank runs and panics, hyperinflation, embezzling, and counterfeiting. These are lapses of quality. Can banks ensure quality? Will the free-banking system prevent such problems? The authors suggest that managing solvency and providing assurances of solvency are easier today because of technology; up-to-the-moment financial statements and assessments can be generated and made widely available. Contractual arrangements giving banks options to delay redemption can be more easily posted, managed, and conveyed to worried depositors. Hyperinflation and counterfeiting can be discouraged by rapid feedback mechanisms like adverse clearing. In an in-

formation age, reputation stays more current and counts for more. Friedman and Macintosh consider three models of free banking and explore how technology helps free-banking proponents respond to market-imperfection arguments.

Regulators claim that individuals suffer from an insurmountable ignorance of their own needs and the true quality of available options. Restrictions imposed in the name of quality and safety hamstring many important areas of business and everyday life. Yet in every instance new technology is making claims of consumer vulnerability less and less credible and proving that the demand for assurance elicits supply.

Technology Dissolves Natural-Monopoly Arguments

The so-called public utilities—water, sanitation, electricity, natural gas, telephone, and cable television—have long featured an interconnected network, or grid, by which water, gas, and electrons are distributed from central sources to users throughout the community. The construction and operation of the distribution system involve large up-front costs that are irreversible. Adding users to the system entails low marginal costs, and distributing product entails a low current cost. Thus, in this standard portrayal, a single distribution system continues to enjoy economies of scale as it adds volume over time. The cost structure therefore will, in a free market, give rise to a single provider: a natural monopoly. The single provider may then charge high prices, produce low quantity and quality, and make excessive profits. Would-be competitors do not enter and bid down prices because once they have invested in a competing system, the incumbent firm will lower its price and possibly bring losses to both firms. Hence no one would be foolhardy enough to challenge the monopolist. Using this reasoning, regulators and interventionists have argued that government ought to supervise such utilities and control their prices.

Whatever the historical validity of the natural-monopoly argument, it is clear that in many service areas, technology has brought alternatives to the traditional provider, alternatives that belie the traditional assumptions about costs and integration requirements. Furthermore, rapid change itself complicates the problem of regulators and planners. As Milton Friedman (1962, 28) put it: “In a rapidly changing society, however, the conditions making for technical monopoly frequently change and I suspect that both public regulation and public monopoly are likely to be less responsive to such changes in conditions . . . than private monopoly.”

Alvin Lowi Jr. and Clyde Wayne Crews Jr. describe a significant trend in the delivery of electricity, toward what they call dispersed generation. Increasingly viable is small-scale generation by microturbines powered by diesel, natural gas, or other fuels. On-site generators offer users—office buildings, factories, housing developments, or even single homes—the option of creating their own self-contained loop. Lowi and Crews also explain that the costs of creating new and competing loops have fallen because of computer-controlled drilling and line laying, allowing workers to snake under streets and buildings without above-ground disturbance. These developments dissolve the assumptions of high fixed and sunk costs. Entry and competition in the market would, in a free market, be very viable. Furthermore, technology has greatly advanced the possibility of combining electricity generation with steam power, heat, and air conditioning and of combining electricity distribution with telecommunications, vastly complicating the job of any regulator who presumes to know how to improve on the invisible hand.

Alvin Lowi Jr., a mechanical engineer by profession and a social scientist by avocation, contributes his own chapter on water delivery. It nicely parallels the electricity chapter, as it too expounds on the viability of on-site utility management. Lowi argues that homes, developments, businesses, and so on would, if permitted, often choose not to hook up to the centralized utility grid. The substitute for transporting massive amounts of water via the grid, both to and from users (the latter to deal with wastewater), is developing on-site systems. Such systems would inventory a quantity of raw water, treat it according to a quality hierarchy for local uses, and then recover the raw water from the waste for inventory and reuse. On-site water and waste treatment requires refinement, disposal, and replenishment. Lowi explains the science of nine basic water treatment methods and describes the profusion of modern applications and apparatus now available on the market. So-called gray water could be treated and used for landscaping, cooling, firefighting, and sanitation. The small amount of water for sensitive human uses like bathing, cooking, and drinking would be distilled to a purity and a safety that the current one-quality-fits-all water systems could not hope to match. The “black water” from toilets and kitchen-disposal units would be treated and disposed of via sewage, vacuum truck, or other methods. Depending on recovery rates, the system would need replenishment from rain-water catchments, trucked water, or other sources. Lowi emphasizes that combining on-site utilities may yield economies of scope (the heat from an electricity generator could warm and distill water, for example). He con-

cludes by highlighting the complexity of the institutional possibilities and rejecting the national-monopoly rationales for government control: “Technological advancements in water supply and delivery would allow the natural competition of many substitutes and alternatives, if permitted by law.”

Rick Geddes looks at how technology affects the rationales for a government-created monopoly in postal services. One of those rationales is that free-market letter delivery would suffer from natural monopoly. After noting that the argument never really made much sense, Geddes explains how technology erodes whatever plausibility the argument enjoyed in matters of postal service. The main effect has been the development of powerful substitutes for letters, notably telephone, facsimile, and electronic mail, with broadband on the way. If we define “postal services” narrowly as letter delivery, these substitutes make the demand curve for postal services flatter or more elastic. Thus, the whole concern about a letter-delivery monopolist exploiting consumers loses plausibility. When people have easy alternatives, a provider cannot jack up prices without reducing revenues. Geddes identifies numerous other effects of technology, such as the facility it gives to contracting for pieces of the delivery system. Indeed, the whole notion of a postal service as a monolithic system is the artifact more of government intervention than of underlying economic conditions. Even today we have numerous delivery systems going to virtually every mailing address in the country, and where permitted by law, technology enhances the competition among them.

Other Areas in Which Technology Bolsters the Case for Free Enterprise

Several of the chapters do not fit so neatly into market-imperfection categories. A visionary and provocative chapter is that by Spencer MacCallum on what he calls entrepreneurial communities. He proposes that local governance of residential communities be proprietary and contractual. More specifically, he favors the model of the multiple-tenant income property (MTIP), a model familiar to us in the form of apartment complexes, office parks, hotels, and shopping malls. What has succeeded in the business world could also, if permitted, succeed in residential living. In MTIPs, the entrepreneurial firm retains the property title and leases space to tenants on a long-term basis. MacCallum argues that entrepreneurial ownership of the common resources and environs far surpasses the democratic governance that marks subdivided communities (whether homeowners’ associations or

municipal governments). MacCallum is advocating, in a sense, living in “company towns.” He engages the arguments against such an arrangement, to wit, that tenants settle down and become attached to many of the features of that specific set of environs, enabling the firm to exploit the residents. Future desires cannot be known in advance, and future service and prices cannot be contracted for in detail. It is costly to negotiate, write, and enforce elaborate contingent contracts that would shield against opportunism. MacCallum contends that technology has greatly diminished these pitfalls. Modern transportation, particularly the private automobile, and telecommunications have made our lives less embedded in our residential locale. Facets of life (work, school, church, friends) are less rigidly tied to residence. Furthermore, technology facilitates our ability to switch locales. “Company towns,” then, have to keep the customer satisfied. Also, technology enhances the reputational incentives for trustworthiness because any lapse would be more readily noted via the Internet and made known to other customers, both current and prospective. MacCallum envisions people living in residential communities that resemble hotels: common areas, amenities, and utilities would be managed by the property owner, with prudent regard for the tenants’ desires for social interaction and communion. Meanwhile, local government could be largely dismissed.

The chapter on endangered species by Richard Stroup and Jane Shaw provides a striking variation on a theme. Whereas other chapters in this book explain how technology mitigates market imperfections, their chapter suggests that technology exacerbates the problems of the Endangered Species Act. In managing and sustaining wildlife, know-how comes in both low-tech and high-tech forms. Some of the most important breakthroughs are the discovery of breeding, nesting, migrating, or feeding patterns. Low-tech methods of enriching habitat, such as setting up proper nesting boxes for woodpeckers, are often as important as more sophisticated methods like tagging and monitoring. The tragedy of the Endangered Species Act is that it often drives landowners to put know-how to use *against* wildlife preservation. The act empowers federal officials to attenuate landowners’ property rights, notably by restricting land use, if listed species are found on the land. The situation gives landowners the incentive to rid their land of listed (or potentially listed) species lest they attract the federal skunks. Landowners use know-how to eradicate fauna or make the land inhospitable in advance of their presence. Were landowners secure in their property rights, they would be more inclined to allow hobbyists, foundations, and other concerned parties to cooperate voluntarily, as guests, in wildlife manage-

ment on the land, making the best use of both low-tech and high-tech methods. The chapter raises the question of whether technology intensifies government failure in other policy areas as well.

Concluding Remarks

The appropriateness of alternate policies depends on the state of technology. As technology advances, the intellectual case for specific policies changes. Thus, technology imposes on policies and their justifications what may be called an expected intellectual half-life. The faster that technology advances, the shorter the intellectual half-life of government policies will be.

This book suggests more specifically that technological advancement usually favors the effectiveness of free enterprise over government intervention. If that is the case, interventionists need to concern themselves especially with the intellectual half-life of their positions, lest they promote policies appropriate yesterday but no longer appropriate today or tomorrow.

Just as policy depends on the state of technology, so technology depends on policy. The technological advancements treated in this volume help solve social problems. In doing so, they bring affected parties some kind of profit. Technological advancement is itself a member of the invisible hand, the invisible hand's tending of its current shortcomings. "Just as technology can affect the formation of property rights, the institutional environment in which property rights evolve can also influence the development of technology" (Anderson and Hill 2001, xiii). Voluntary social mechanisms and technological advancement enjoy a complex dialectic of mutual improvement.

NOTES

1. Cowen 1988 is an excellent compilation of basic "market-failure" works and criticisms.

2. Cliffe Leslie 1879, 224. He writes also: "And just in proportion . . . as industry and commerce are developed, does the social economy become complex, diversified, changeful, uncertain, unpredictable, and hard to know, even in its existing phase" (223).

3. See Roger Koppl 2000, who writes, "The level of complexity is likely to outstrip our analytical engine" (105).

REFERENCES

- Anderson, Terry L., and Peter J. Hill, eds. 2001. *The Technology of Property Rights*. Lanham, MD: Rowman & Littlefield.
- Arrow, Kenneth. 1974. "Limited Knowledge and Economic Analysis." *American Economic Review* 64: 1–10.
- Brin, David. 1998. *The Transparent Society: Will Technology Force Us to Choose between Privacy and Freedom?* Reading, MA: Addison-Wesley.
- Coase, Ronald H. 1974. "The Lighthouse in Economics." *Journal of Law and Economics* 17 (October): 357–76. (Reprinted in Cowen 1988.)
- Cowen, Tyler, ed. 1988. *The Theory of Market Failure: A Critical Examination*. Fairfax, VA: George Mason University Press.
- DeLong, J. Bradford, and A. Michael Froomkin. 2000. "Speculative Microeconomics for Tomorrow's Economy." Available on DeLong's Web page: <http://econ161.berkeley.edu/>.
- Friedman, David. 1995. "Why Encryption Matters." Available at www.best.com/~ddfr/Libertarian/Why_Crypto_Matters.html.
- Friedman, Milton. 1962. *Capitalism and Freedom*. Chicago: University of Chicago Press.
- Friedman, Thomas L. 1999. *The Lexus and the Olive Tree*. New York: Farrar, Straus & Giroux.
- Gilder, George. 1989. *Microcosm: The Quantum Revolution in Economics and Technology*. New York: Simon & Schuster.
- Hayek, Friedrich A. 1978. "The Pretence of Knowledge" (Nobel lecture, 1974). In Hayek's *New Studies in Philosophy, Politics, Economics and the History of Ideas*. Chicago: University of Chicago Press.
- . 1979. *Law, Legislation and Liberty*. Vol. 3, *The Political Order of a Free People*. Chicago: University of Chicago Press.
- Henderson, David R. 2000. "Information Technology as a Universal Solvent for Removing State Stains." *Independent Review* 4, no. 4 (spring): 517–23.
- Huber, Peter. 1996. "Cyber Power." *Forbes*, December 2, 142–47.
- Koppl, Roger. 2000. "Policy Implications of Complexity: An Austrian Perspective." In *The Complexity Vision and the Teaching of Economics*, edited by D. Colander, 97–117. Northampton, MA: Edward Elgar.
- Leslie, T. E. Cliffe. 1879. "The Known and the Unknown in the Economic World" (originally published in *Fortnightly Review*, June 1). Reprinted in his *Essays in Political Economy*, 221–42. London: Longmans, Green, 1888.
- McKenzie, Richard D., and Dwight R. Lee. 1991. *Quicksilver Capital: How the Rapid Movement of Wealth Has Changed the World*. New York: Free Press.
- Rosen, Harvey S. 1992. *Public Finance*. 3d ed. Homewood, IL: Irwin.

- Shane, Scott. 1994. *Dismantling Utopia: How Information Ended the Soviet Union*. Chicago: Ivan R. Dee.
- Tullock, Gordon. 1971. "Public Decisions as Public Goods." *Journal of Political Economy* 79, no. 4: 913–18.
- Van Zandt, David E. 1993. "The Lessons of the Lighthouse: 'Government' or 'Private' Provision of Goods." *Journal of Legal Studies* 22 (January): 47–72.