Speculative Microeconomics for Tomorrow's Economy

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A. The Utility of the Market

Two and a quarter centuries ago the Scottish moral philosopher Adam Smith used a particular metaphor to describe the competitive market system, a metaphor which still resonates today. He saw the competitive market as a system in which:

"...every individual... endeavours as much as he can... to direct... industry so that its produce may be of the greatest value.... neither intend[ing] to promote the public interest, nor know[ing] how much he is promoting it.... He intends only his own gain, and he is in this, as in many other cases, led by an invisible hand to promote an end that was no part of his intention.... By pursuing his own interest he frequently promotes that of society more effectually than when he really intends to promote it..."

Adam Smith's claim back in 1776 that the market system promoted the general good was new. Today it is one of the most frequently-heard commonplaces. For Adam Smith's praise of the market as a social mechanism for regulating the economy was the opening shot of a grand campaign to reform how politicians and governments looked at the economy.

The campaign waged by Adam Smith and his successors was completely successful. The past two centuries have seen his doctrines woven into the fabric of how our society works. It is hard to even begin to think about our society without basing one's thought to some degree on Adam Smith. And the governments that have followed the path Adam Smith laid down today preside over economies that are more materially prosperous and technologically powerful than ever before seen.

Belief in free trade, an aversion to price controls, freedom of occupation, freedom of
domicile, freedom of enterprise, and the other corollaries of belief in Smith's *invisible hand* have today become *the* background assumptions for thought about the relationship between the government and the economy. A free-market system, economists claim and most participants in capitalism believe, generates a level of total economic product that is as high as possible--and is certainly higher than under any alternative system that any branch of humanity has conceived and attempted to implement. It is even possible to prove the "efficiency" of a competitive market--albeit under restrictive technical assumptions.

The lesson usually drawn from this economic success story is *laissez-faire, laissez-passer*: in the overwhelming majority of cases the best thing the government can do for the economy is simply to leave it alone. Define property rights, set up honest courts, perhaps rearrange the distribution of income, impose minor taxes and subsidies to compensate for well-defined and narrowly-specified "market failures"--but otherwise the economic role of the government is to disappear.

The main argument for a free competitive market system is the dual role played by prices. On the one hand, prices serve to ration demand: anyone unwilling to pay the market price because he or she would rather do other things with his or her (not unlimited) money does not get the good (or service). On the other hand, price serves to elicit production: any organization that can make a good (or provide a service) for less than its market price has a powerful financial incentive to do so. Thus what is produced goes to those who value it the most. What is produced is made by the organizations that can make it the cheapest. And what is produced is whatever the ultimate users value the most.

You can criticize the market system because it undermines the values of community and solidarity. You can criticize the market system because it is unfair--for it gives good things to those who have control over whatever resources turn out to be most scarce as society
solves its production allocation problem, not to those who have any moral right to good things. But--at least under the conditions economists have for two and a quarter centuries first implicitly and more recently explicitly assumed--you cannot criticize the market system for being unproductive.

Adam Smith's case for the invisible hand so briefly summarized above will be familiar to almost all readers: it is one of the foundation-stones of our civilization's social thought. Our purpose in this chapter is to shake these foundations--or at least to make readers aware that the changes in technology now going on as a result of the revolutions in data processing and data communications may shake these foundations. Unexpressed but implicit in Adam Smith's argument for the efficiency of the market system are assumptions about the nature of goods and services and the process of exchange--assumptions that fit reality less well today than they did back in Adam Smith's day.

Moreover, these implicit underlying assumptions are likely to fit the "new economy" of the future even less well than they fit the economy of today.

1. The Structure of This Chapter

Thus the next section of this chapter deconstructs Adam Smith's case for the market system. It points out three assumptions about production and distribution technologies necessary if the invisible hand is to work as Adam Smith claimed it did. We point out that these assumptions are being undermined more and more by the revolutions in data processing and data communications currently ongoing.

In the subsequent section we take a look at things happening on the frontiers of electronic
commerce and in the developing markets for information. Our hope is that what is now going on at the frontiers of electronic commerce may contain some clues to processes that will be more general in the future.

Our final section does not answer all the questions we raise. We are not prophets, after all. Thus our final section raises still more questions, for the most we can begin to do today is to organize our concerns. By looking at the behavior of people in high-tech commerce--people for whom the abstract doctrines and theories that we present have the concrete reality of determining if they get paid--we can make some guesses about what the next economics and the next set of sensible policies might look like, if indeed there is going to be a genuinely new economy and thus a genuinely next economics.

Moreover, we can warn against some pitfalls in the hope that such warnings might make things better rather than worse.

B. "Technological" Prerequisites of the Market Economy

The ongoing revolution in data processing and data communications technology may well be starting to undermine those basic features of property and exchange that make the invisible hand a powerful social mechanism for organizing production and distribution. The case for the market system has always rested on three implicit pillars, three features of the way that property rights and exchange worked.

Call the first feature excludability: the ability of sellers to force consumers to become buyers, and thus to pay for whatever goods and services they use.
Call the second feature **rivalry**: a structure of costs in which two cannot partake as cheaply as one, in which producing enough for two million people to use will cost at least twice as many of society's resources as producing enough for one million people to use.

Call the third **transparency**: the ability of individuals to see clearly what they need and what is for sale, so that they truly know just what it is that they wish to buy.

All three of these pillars fit the economy of Adam Smith's day relatively well. The prevalence of craft as opposed to mass production guaranteed that two could only be made at twice the cost of one. The fact that most goods and services were valued principally for their (scarce) physical form meant that two could not use one good: if I am using the plow to plow my field today, you cannot use it to plow yours. Thus rivalry was built into the structure of material life that underpinned the economy of production and exchange.

Excludability was less a matter of nature and more a matter of culture, but certainly by Smith's day large-scale theft and pillage was more the exception than the rule: the courts and the law were there to give property owners the power to restrict the set of those who could utilize their property to those who had paid for the privilege.

Last, the slow pace and low level of technology meant that the purpose and quality of most goods and services were transparent: what you saw was pretty much what you got.

All three of these pillars fit much of today's economy pretty well too--although the fit for the telecommunications and information-processing industries is less satisfactory. But they will fit tomorrow's economy less well than today's. And there is every indication that they will fit the twenty-first century economy relatively poorly.
As we look at developments along the leading technological edge of the economy, we can see that considerations that used to be second-order "externalities" that served as corrections growing in strength to possibly become first-order phenomena. And we can see the invisible hand of the competitive market beginning to work less and less well in an increasing number of areas.

1. Excludability

In the information-based sectors of the next economy, the owners of goods and services--call them "commodities" for short--will find that they are no longer able to easily and cheaply exclude others from using or enjoying the commodity. The carrot-and-stick which had enabled owners of property to extract value from those who wanted to use it was always that if you paid you got to make use of it, and if you did not pay you did not get to make use of it.

But digital data is cheap and easy to copy. Methods do exist to make copying difficult, time-consuming, and dangerous to the freedom and wealth of the copier, but these methods add expense and complexity. "Key disk" methods of copy protection for programs vanished in the late 1980s as it became clear that the burdens they imposed on legitimate owners and purchasers were annoying enough to cause buyers to vote-with-their-feet for alternative products. Identification-and-password restrictions on access to online information are only as powerful as users' concern for information providers' intellectual property rights--which is surely not as powerful as the information providers' concern.
In a world of clever hackers, these methods are also unreliable. The methods used to protect Digital Video Discs against casual copying are no longer secure.

Without excludability, the relationship between producer and consumer becomes much more akin to a gift-exchange than a purchase-and-sale relationship. The appropriate paradigm then shifts in the direction of a fund-raising drive for a National Public Radio station. When commodities are not excludable then people simply help themselves. If the user feels like it he or she may make a "pledge" to support the producer. The user sends money to the producer not because it is the only way to gain the power to utilize the product, but out of gratitude and for the sake of reciprocity.

This reciprocity-driven revenue stream may well be large enough that producers cover their costs and earn a healthy profit. Reciprocity is a basic mode of human behavior. People in the large do feel a moral obligation to tip cabdrivers and waiters. People do contribute to National Public Radio. But without excludability the belief that the market economy produces the optimal quantity of any commodity is hard to justify. Other forms of provision--public support funded by taxes that are not voluntary, for example--that had fatal disadvantages vis-a-vis the competitive market when excludability reigned may well deserve reexamination.

We can get a glimpse of how the absence of excludability can warp a market and an industry by taking a brief look at the history of network television. During its three-channel heyday in the 1960s and 1970s, North American network television was available to anyone with an antenna and a receiver: broadcasters lacked the means of preventing the public from getting the signals for free. Free access was, however, accompanied by scarce bandwidth, and by government allocation of the scarce bandwidth to producers.
The absence of excludability for broadcast television did not destroy the television broadcasting industry. Broadcasters couldn't charge for what they were truly producing, but broadcasters worked out that they could charge for something else: the attention of the program-watching consumers during commercials. Rather than paying money directly, the customers of the broadcast industry merely had to endure the commercials (or get up and leave the room; or channel-surf) if they wanted to see the show.

This "attention economy" solution prevented the market for broadcast programs from collapsing: it allowed broadcasters to charge someone for something, to charge advertisers for eyeballs rather than viewers for programs. But it left its imprint on the industry. Charging-for-advertising does not lead to the same invisible hand guarantee of productive optimum as does charging for product. In the case of network television, audience attention to advertisements was more-or-less unconnected with audience involvement in the program.

This created a bias toward lowest-common-denominator programming. Consider two programs, one of which will fascinate 500,000 people, and the other of which 30 million people will watch as slightly preferable to watching their ceiling. The first might well be better for social welfare: the 500,000 with a high willingness-to-pay might well, if there was a way to charge them, collectively outbid the 30 million apathetic couch potatoes for the use of scarce bandwidth to broadcast their preferred program. Thus a network able to collect revenues from interested viewers would broadcast the first program, seeking the applause (and the money) of the dedicated and forgoing the eye-glazed semi-attention of the larger audience.

But this competitive process breaks down when the network obtains revenue by selling
commercials to advertisers. The network can offer advertisers either 1,000,000 or 60 million eyeballs. How influenced the viewers will be by the commercials depends relatively little on how much they like the program. As a result, charging-for-advertising gives every incentive to broadcast what a mass audience would tolerate. It gives no incentive to broadcast what a niche audience would love.

As bandwidth becomes cheaper, these problems become less important: one particular niche program may well be worth broadcasting when the mass audience has become sufficiently fragmented by the viewability of multiple clones of bland programming. Until then, however, expensive bandwidth combined with the absence of excludability meant that broadcasting revenues depended on the viewer numbers rather than the intensity of demand. Non-excludability helped ensure that broadcast programming would be "a vast wasteland."

In the absence of excludability industries today and tomorrow are likely to fall prey to analogous distortions. Producers' revenue streams--wherever they come from--will be only tangentially related to the intensity of user demand. Thus the flow of money through the market will not serve its primary purpose of registering the utility to users of the commodity being produced. There is no reason to think _ex ante_ that the commodities that generate the most attractive revenue streams paid by advertisers or others ancillary will be the commodities that ultimate consumers would wish to see produced.

2. Rivalry

In the information-based sectors of the next economy the use or enjoyment of the information-based commodity will no longer necessarily involve rivalry. With most
tangible goods, if Alice is using a particular good, Bob cannot be. Charging the ultimate consumer the good's cost of production or the free market price provides the producer with an ample reward for his or her effort. It also leads to the appropriate level of production: social surplus (measured in money) is not maximized by providing the good to anyone whose final demand for a commodity is too weak to wish to pay the cost for it that a competitive market would require.

But if goods are non-rival--if two can consume as cheaply as one--then charging a per-unit price to users artificially restricts distribution: to truly maximize social welfare you need a system that supplies everyone whose willingness to pay for the good is greater than the marginal cost of producing another copy. And if the marginal cost of reproduction of a digital good is near-zero, that means almost everyone should have it for almost free. However, charging price equal to marginal cost almost surely leaves the producer bankrupt, with little incentive to maintain the product except the hope of maintenance fees, and no incentive whatsoever to make another one except that warm fuzzy feeling one gets from impoverishing oneself for the general good.

Thus a dilemma: if the price of a digital good is above the marginal cost of making an extra copy, some people who truly ought--in the best of all possible worlds--to be using it do not get to have it, and the system of exchange that we have developed is getting in the way of a certain degree of economic prosperity. But if price is not above the marginal cost of making an extra copy of a non-rival good, the producer will not get paid enough to cover costs. Without non-financial incentives, all but the most masochistic producer will get out the business of production.

More important, perhaps, is that the existence of large numbers of important and valuable goods that are non-rival casts the value of competition itself into doubt. Competition has
been the standard way of keeping individual producers from exercising power over consumers: if you don't like the terms the producer is offering, then you can just go down the street. But this use of private economic power to check private power may come at an expensive cost if competitors spend their time duplicating one another's efforts and attempting to slow down technological development in the interest of obtaining a compatibility advantage, or creating a compatibility or usability disadvantage for the other guy.

One traditional answer to this problem--now in total disfavor--was to set up a government regulatory commission to control the "natural monopoly". The commission would set prices, and do the best it could to simulate a socially optimum level of production. On the eve of World War I when American Telephone and Telegraph--under the leadership of its visionary CEO Theodore N. Vail--began its drive for universal coverage, a rapid political consensus formed both in Washington and within AT&T that the right structural form for the telephone industry was a privately-owned publicly-regulated national monopoly.

While it may have seemed like the perfect answer in the Progressive era, in this more cynical age commentators have come to believe that regulatory commissions of this sort almost inevitably become "captured" by the industries they are supposed to regulate. Often this is because the natural career path for analysts and commissioners involves someday going to work for the regulated industry in order to leverage expertise in the regulatory process; sometimes it is because no one outside the regulated industry has anywhere near the same financial interest in manipulating the rules, or lobbying to have them adjusted. The only effective way a regulatory agency has to gauge what is possible is to examine how other firms in other regions are doing. But such "yardstick" competition proposals--judge how this natural monopoly is doing by comparing it to other analogous organizations--are notoriously hard to implement.
A good economic market is characterized by competition to limit the exercise of private economic power, by price equal to marginal cost, by returns to investors and workers corresponding to the social value added of the industry, and by appropriate incentives for innovation and new product development. These seem impossible to achieve all at once in markets for non-rival goods—and digital goods are certainly non-rival.

3. Transparency

In many information-based sectors of the next economy the purchase of a good will no longer be transparent. The invisible hand assumed that purchasers know what it is that they want and what they are buying so that they can effectively take advantage of competition and comparison-shop. If purchasers need first to figure out what they want and what they are buying, there is no good reason to presume that their willingness to pay corresponds to its true value to them.

Why is transparency at risk? Because much of the value-added in the data-processing and data-communications industries today comes from complicated and evolving systems of information provision. Adam Smith's pinmakers sold a good that was small, fungible, low-maintenance and easily understood. Alice could buy her pins from Gerald today, and from Henry tomorrow. But today's purchaser of, say, a cable modem connection to the internet from AT&T-Excite-@Home is purchasing a bundle of present goods and future services, and is making a down payment on the establishment of a long-term relationship with AT&T-Excite-@Home. Once the relationship is established, both buyer and seller find themselves in different positions. Adam Smith's images are less persuasive in the context of services—especially bespoke services which require deep knowledge of the customer's
wants and situation (and of the maker's capabilities)--which are not, by their nature fungible or easily comparable.

When Alice shops for a software suite, she not only wants to know about its current functionality--something notoriously difficult to figure out until one has had days or weeks of hands-on experience--but she also needs to have some idea of the likely support that the manufacturer will provide. Is the line busy at all hours? Is it a toll call? Do the operators have a clue? Will next year's corporate downsizing lead to longer holds on support calls?

Worse, what Alice really needs to know cannot be measured at all before she is committed: learning how to use a software package is an investment she would prefer not to repeat. Since operating systems change version numbers frequently, and interoperability needs changes even more often, Alice needs to have a prediction about the likely upgrade path for her suite. This, however, turns on unknowable and barely guessable factors: the health of the corporation, the creativity of the software team, the corporate relationships between the suite seller and other companies.

Some of the things Alice wants to know, such as whether the suite works and works quickly enough on her computer, are potentially measurable at least--although one rarely finds a consumer capable of measuring them before purchase, or a marketing system designed to accommodate such a need. You buy the shrink-wrapped box at a store, take it home, unwrap the box--and find that the program is incompatible with your hardware, your operating system, or one of the six programs you bought to cure defects in the hardware or the operating system...

Worse still, the producer of a software product has every incentive to attempt to "lock in" as many customers as possible. Operating system revisions that break old software versions
require upgrades. And a producer has an attractive and inelastic revenue source to the extent that "lock in" makes switching to an alternative painful. While consumers prefer the ability to comparison-shop and to switch easily to another product, producers fear this ability--and have incentives to perform subtle tweaks to their programs to make it difficult to do so.

4. The Economics of Market Failure

That the absence of excludability, rivalry, or transparency is bad for the functioning invisible hand is not news. The analysis of failure of transparency has made up an entire subfield of economics for decades: "imperfect information." Non-rivalry has been the basis of the theory of government programs and public goods, as well as of natural monopolies: the solution has been to try to find a regulatory regime will mimic the decisions that the competitive market ought to make, or to accept that the "second-best" public provision of the good by the government is the best that can be done.

Analysis of the impact of the lack of excludability is the core of the economic analysis of research and development. It has led to the conclusion that the best course is to try to work around non-excludability by mimicking what a well-functioning market system would have done. Use the law to expand "property," or use tax-and-subsidy schemes to promote actions with broad benefits.

But the focus of analysis has traditionally been on overcoming "frictions": how can we make this situation where the requirements of laissez faire fail to hold into a situation in which the invisible hand works tolerably well? As long as it works well throughout most of the economy, this is a very sensible analytical and policy strategy. A limited number of
government programs and legal doctrines will be needed to closely mimic what the invisible hand would do if it could function properly in a few distinct areas of the economy (like the regional natural monopolies implicit in the turn-of-the-twentieth-century railroad, or in government subsidies basic research).

C. Out on the Cybernetic Frontier

But what happens when the friction becomes the machine?

What will happen in the future should problems of non-excludability, of non-rivalry, of non-transparency come to apply to a large range of the economy? What happens should they come to occupy as central a place in business decision-making as inventory control or production operations management do today? In the natural sciences, perturbation-theory approaches break down when the deviations of initial conditions from those necessary for the simple solution become large. Does something similar happen in political economy? Is examining how the market system handles a few small episodes of "market failure" a good guide toward how it will handle many large ones?

We do not know. But we do want to take a first step toward discerning what new theories of the new markets might look like should new visions turn out to be necessary (or should old visions need to be adjusted). The natural place to look is to examine how enterprises and entrepreneurs are reacting today to the coming of non-excludability, non-rivalry, and non-transparency on the electronic frontier. The hope is that experience along the frontiers of electronic commerce will serve as a good guide to what pieces of the theory are likely to be most important, and will suggest areas in which further development might have a high rate of return.
1. The Market for Software (Shareware, Public Betas and More)

We noted above that the market for modern, complex products is anything but transparent. While one can think of services, such as medicine, which are particularly opaque to the buyer, today it is difficult to imagine a more opaque product than software. Indeed, when one considers the increasing opacity of products in the context of the growing importance of services to the economy, it suggests that transparency will become a particularly important issue in the next economy.

Consumers' failure to acquire full information about the software they buy certainly demonstrates that acquiring the information must be expensive. In response to this cost, social institutions have begun to spring up to get around the shrink-wrap dilemma. The first was so-called shareware: you download the program, if you like the program you send its author some money, and maybe in return you get a manual, access to support, or an upgraded version.

The benefit to try-before-you-buy is precisely that it makes the process more transparent. The cost is that try-before-you-buy often turns out to be try-use-and-don't-pay.

The next stage beyond shareware has been the evolution of the institution of the "public beta." This public beta is a time-limited (or bug-ridden, or otherwise restricted) version of the product: users can investigate the properties of the public beta version to figure out if the product is worthwhile. But to get the permanent (or the less-bug-ridden) version, they have to pay.
Yet a third is the "dual track" version: Eudora shareware versus Eudora Professional, for example. Perhaps the hope is that users of the free low-power version will some day become richer, or less patient, or find they have greater needs. At that point they will find it least disruptive to switch to a product that looks and feels familiar, that is compatible with their habits, and their existing files. In effect (and if the sellers are lucky), the free version captures them as future customers before they are even aware they are future buyers.

The developing free-public-beta industry is a way of dealing with the problem of lack of transparency. It is a relatively benign development, in the sense that it involves competition through distribution of lesser versions of the ultimate product. An alternative would be (say) the strategy of constructing barriers to compatibility: the famous examples in the computer industry come from the 1970s when the Digital Equipment Corporation made non-standard cable connectors; from the mid-1980s when IBM attempted to appropriate the entire PC industry through the PS/2 line; and from the late 1980s when Apple Computers used a partly ROM-based operating system to exclude clones.

Fortunately for consumers, these alternative strategies proved (in the latter two cases at least) to be catastrophic failures for the companies pursuing them. Perhaps the main reason that the free-public-beta strategy is now dominant is this catastrophic failure of strategies of non-compatibility--even though they did come close to success.

A fourth, increasingly important, solution to the transparency problem is Open Source software. Open Source solves the software opacity problem with total transparency: the source code itself is available to all for examination and re-use. Open Source programs can be sold, but whenever a right to use a program is conferred, it brings with it the additional rights to inspect and alter the software, and to convey the altered program to others.
In the "Copyleft license," for example, anyone may modify and re-use the code, provided that they comply with the conditions in the original license and impose similar conditions of openness and re-usability on all subsequent users of the code. License terms do vary. This variation itself is a source of potential opacity. However, it is easy to envision a world in which Open Source software plays an increasingly-large role.

Open Sources' vulnerability (and perhaps also its strength) is that it is, by design, only minimally excludible. Without excludability, it is harder to get paid for your work. Traditional economic thinking suggests that all other things being equal, people will tend to concentrate their efforts on things that get them paid. And when, as in software markets, the chance to produce a product that dominates a single category holds out the prospect of enormous payment (think "Windows"), one might expect that effort to be greater still.

Essentially volunteer software development would seem particularly vulnerable to the tragedy of the commons. Open Source has, however, evolved a number of strategies that at least ameliorate and may even overcome this problem. Open Source authors gain status by writing code. Not only do they gain kudos, but the work can be used as a way to gain marketable reputation. Writing Open Source code that becomes widely used and accepted is serves as a virtual business card--and helps overcome the lack of transparency in the market for high-level software engineers.

The absence of the prospect of an enormous payout may retard the development of new features in large, collaborative, open-source projects. It may also reduce the richness of the feature set. However, since most people apparently use a fairly small subset of the features provided by major packages, this may not be a major problem. Furthermore, open source may make proprietary designer add-ons both technically feasible and economically rational.
In open source the revenues cannot come from traditional intellectual property rights alone. One must provide some sort of other value, be it help desk, easy installation, or extra features, in order to be paid. Moreover, there remains the danger that one may not be paid at all.

Nevertheless, open source already has proven itself to be viable in important markets: the world wide web as we know it exists because Tim Berners-Lee Open-Sourced html and http.

2. Of Shop-bots, Online Auctions, and Meta-Sites

Predictions abound as to how software will use case- and rule-based thinking to do your shopping for you, advise you on how to spend your leisure time, and in general organize your life for you. But that day is still far in the future. So far, we have only the early generations of the knowledge-scavenging virtual robot and the automated comparison shopper. Already, however, we can discern some trends, and identify places where legal rules are likely to shape micro-economic outcomes. The interaction between the law and the market has, as one would expect, distributional consequences. More surprisingly, perhaps, it also has potential implications for economic efficiency.

Shop-Bots

BargainFinder was one of the first Internet-based shopping agents. In its first incarnation, back in 1997, it did just one thing. Even then it did it too well for some. Now that Bargain Finder and other intelligent shopping agents have spread into a wide range of markets, a virtual war over access to and control of price information is raging in the online
marketplace. Thus one has to ask: does the price come at a price?

In the initial version of BargainFinder, and to this day, the user enters the details of a music compact disk she might like to purchase. BargainFinder interrogated several online music stores that might offer to sell them. It then reports back the prices in a tidy table that makes comparison shopping easy. Initially, the system was not completely transparent: it was not always possible to discern the vendor's shipping charges without visiting the vendor's web site. But as BargainFinder's inventors said, it was "only an experiment."

Today, it's no longer an experiment. Shipping and handling is included as a separate and visible charge. The output is a handsome table which can be sorted by price, by speed of delivery, or by merchant. It can be further customized to take account of shipping costs by zip code, and results can be sorted by price or speed of delivery. While the user sees the names of the firms whose prices are listed, it's a short list, and there is no way to know what other firms might have been queried.

Other, newer, shopping agents take a more aggressive approach. R-U-Sure, available at http://r-u-sure.com, installs an application on the desktop that monitors the user's web browsing. Whenever the user interacts with an e-commerce site that R-U-Sure recognizes, it swings into action, and a little box pops up with a wooshing noise. It display the queries it is sending to competing merchants' web stores to see if they have a better price, and reports on the winner.

Competitor clickthebutton, http://www.clickthebutton.com, installs an icon in the taskbar, but only pops up when clicked. The company provides a full and impressively lengthy list of the sites it is capable of querying on the shopper's behalf.
**Bidding Services**

Price competition is also fostered by bidding services and auctions. Bidding services such as http://www.priceline.com (hotels, air tickets) and http://www.nextag.com (consumer goods and electronics) invite customers to send a price they would be willing to pay for a commodity service or good. The price competition is, however, constrained. There is no obvious way for consumers to learn what deals others have been able to secure, and the bidding services appear designed to discourage experimentation designed to find out the market-clearing price.

Priceline requires the consumer to commit to pay if his offer is accepted; Nextag does not, but tracks the user's behavior with a "reputation" number that goes up when a merchant's acceptance of a bid results in a purchase and goes down when an accepted bid does not lead to a purchase. Unlike Priceline, however, Nextag contemplates multi-round negotiations: "sellers" it warns, "will be more likely to respond to your requests if you have a high rating."

At first glance, a highly variegated good like a college education would seem to resist any effort at a bidding process. Nevertheless ecollegebid.org, http://www.ecollegebid.org/, has a web site inviting prospective college students to state what they are willing to pay and then offers to match it with a "college's willingness to offer tuition discounts." Although the list of participating colleges is not published, or even shared with competing colleges, Executive Director Tedd Kelly states that 6 colleges are set to participate and negotiations are under way with more than 15 others. In its first five weeks 508 students placed ecollegebids. Once a college meets a price, the student is asked, but not required, to reply within 30 days--and to submit an application that the college retains the option of rejecting.
Auction Sites

Auction sites provide a different type of price competition, and a different interface with shopping bots. Users can either place each of their bids manually, or they can set up a bidding bot to place their bids for them. Ebay, for example, encourages bidders to not only place an initial bid but also to set up "proxy bidding" in which any competing bid immediately will be met with a response up to the user's maximum price. Since Ebay gets a commission based in part on the final sale price, it gains whenever proxy bidding pushes up the price.

Perhaps the fastest growing segment of the online auction market is aimed at business-to-business transactions. An example is Freemarkets, http://www.freemarkets.com which boasts that "[w]e created online auctions covering approximately $1 billion in 1998, and estimate we saved clients 2-25%. Since 1995, we have created online auctions for more than 30 buyers in over 50 product categories. More than 1,800 suppliers from more than 30 countries have participated in our auctions."

Meta Auction Sites

There are a significant number of competing consumer auction sites in operation. The profusion of auctions has created a demand for meta-sites that provide information about the goods on offer on multiple online auctions. Examples of meta sites include http://www.auctionwatch.com/ and http://www.auctionwatchers.com/.
Auctionwatch, like BargainFinder before it, has become too successful for some. E-bay initially requested meta-sites not list its auctions. When Auctionwatch failed to comply, E-bay threatened auctionwatch.com with legal action, claiming that Auctionwatch's "Universal Search" function, which directs users to auctions on E-bay and competing services (Yahoo, Amazon.com, MSN, Bidstream, and Ruby Lane) is an "unauthorized intrusion" that places an unnecessary load on E-bay's servers, violates E-bay's intellectual property rights, and misleads users by not returning the full results of some searches.

The claim that E-bay's auction prices or the details of the sellers' offers to sell are protected by copyright, trade secret or other intellectual property law is bogus. (However, there are proposals in Congress to change the law in a way that might make the claim more plausible in the future.) Other hitherto untested legal theories might, however, prove more plausible. A claim that meta-sites were imposing somehow damaging E-bay by overloading its servers, or a claim based on some kind of trespass might find more support.

Whether meta-auction sites do burden searchees' servers is itself a difficult factual issue. To the extent that multiple people not interested in bidding see the data on the meta-site, the load on E-bay is reduced. The current law is probably in the meta-sites favor. But there is uncertainty. And this uncertainty is compounded by the possibility of legislation.

Efficiency?

It is particularly appropriate to ask what the economically-efficient solution might be at a time when the law is in some flux. Most economists, be they Adam Smithian classicists, neo-classical Austrians, or more modern economics of information mavens, would at first thought instinctively agree with the proposition that a vendor in a competitive market selling
a standardized product--for one Tiger Lily CD is as good as another--would want customers to know as much as possible about what the vendor offers for sale, and the prices at which the goods are available.

The reason for this near-consensus is that in a competitive market every sale at the offer price should be welcome: all are made at a markup over marginal cost. Thus all on-line CD retailers ought to have wanted to be listed by BargainFinder, if only because every sale that went elsewhere when they had the lowest price was lost profit.

But not so.

A significant fraction of the merchants regularly visited by BargainFinder were less than ecstatic. They retaliated by blocking the agent's access to their otherwise publicly-available data. As of March 1997, one third of the merchants targeted by the BargainFinder locked out its queries. One, CDNow, did so for frankly competitive reasons. The other two said that the costs of large numbers of "hobbyist" queries were too great for them. More E-bay, the best-known online auction site, had begun to walk down the trail blazed by BargainFinder by blocking Auctionwatch's access to Ebay's data.

One possible explanation for the divergence between the economic theorist's prediction that every seller should want to be listed by BargainFinder or Auctionwatch and the apparent outcome is the price-gouging story. In this story, stores blocking comparison sites tend to charge higher than normal prices because they are able to take advantage of consumer ignorance of cheaper alternatives. The stores are gouging buyers by taking advantage of relatively high costs of search.

Our utterly unscientific web-browsing supports the hypothesis that consumers have yet to
figure out how to bring their search costs down--R-U-Sure may need a lot more publicity. Prices are in flux, and do not appear to be behaving the way Adam Smith would predict. Random browsing among various delivery channels reveals wide price fluctuations, peaking at 40% on one occasion for consumer electronics items under $200. In this case BargainFinder and its successors would indeed be valuable developments. They will make markets more efficient and lower prices.

Another possibility is the "kindly service" story. Perhaps stores blocking BargainFinder, R-U-Sure, or meta-sites tend to charge higher than normal prices because they provide additional service or convenience. If commerce becomes increasingly electronic and impersonal (or if "personal" comes to mean "filtered through fiendishly clever software agents"), this sort of humanized attention will become increasingly expensive. To the extent that this additional service or convenience can be provided automatically, things are less clear.

In a sometimes forgotten classic, *The Joyless Economy*, Tibor Scitovsky noted that the advent of mass production of furniture seemed to cause the price of hand-carved chairs to increase, even as the demand for them shrank. As consumers switched to less costly (and less carefully made, one size-fits-all) mass-produced furniture, carvers became scarce and business for remaining carvers became scarcer. Soon only the rich could engage their services.

If the kindly service story is right, the rise of the commodity market creates a risk of a possible decline in service-intensive or higher-quality goods. Mass tastes will be satisfied more cheaply; yet specialty tastes will become more of an expensive luxury. On the other hand, the rise of ShopBots such as BargainFinder or R-U-Sure offers an opportunity for consumers to aggregate their preferences on worldwide scale. Indeed, Mercata, http://
www.mercata.com/, provides a service by which consumers can group together to put in a group buy for a product. The larger the number of units, the lower the price, although it is not clear that the even the resulting price is always lower than might be found by determined web-browsing. Thus the transactions costs associated with both aggregation of identical but disparate preferences, and the communication and satisfaction of individualized preferences should be going down. As it becomes increasingly easy for consumers to communicate their individualized preferences to manufacturers and suppliers, and increasingly easy to tailor goods to individual tastes--be it a CD that only has the tracks you like, customized blue jeans, or a car manufactured just-in-time to your specifications--personalized goods may become the norm, putting the "joy" back into the economy and replacing the era of mass production with an era of mass customization.

Some signs of this were visible even before the information revolution: lower costs of customization has already undermined one of Scitovsky's examples, as fresh-baked bread makes its comeback at many supermarkets and specialty stores. And Alfred P. Sloan created General Motors and the automobile industry of the post-World War II era by piling different body styles, colors, and option packages on top of the same Chevy drive train.

In either the "price gouging" or "kindly service" stories, the advent of services such as BargainFinder and R-U-Sure presents retailers of many goods with a dilemma: If they join in, they contribute towards turning the market for CDs, books, consumer electronics and other similar goods into a commodity market with competition only on price. If they act "selflessly" and stay out, in order to try to degrade the utility of shop-bots and meta-sites (and preserve their higher average markup), they must hope that their competitors will understand their long-run self-interest in the same way.

But overt communication in which all sellers agreed to block BargainFinder would, of
course, violate the Sherman Act. And without a means of retaliation to "punish" players who do not pursue the collusive long-run strategy of blocking BargainFinder, the collapse of the market into a commodity market with only price competition, and with little provided in the way of ancillary shopping services, appears likely.

When we wrote the first draft of this essay, we noted that if CD retailers were trying to undermine BargainFinder by staying away, their strategy appeared to be failing. Some CD retailers who initially blocked BargainFinder then unblocked it, while others were clamoring to join. Since then, the rise of a new generation of meta-sites and alternate means of creating price competition makes the question somewhat moot. The technological arms race pitting meta-sites and shop-bots against merchants will continue, but the advantage seems to be with the attackers, if only due to their numbers.

Whether or not this is an occasion for joy depends on which explanation above is closer to the truth. The growth of the bookstore chain put the local bookshop out of business, just as the growth of supermarkets killed the corner grocer. Not everyone considers this trend to be a victory, despite the lower prices. A human element has been lost, and a "personal service" element that may have led to a better fit between purchaser and purchase has been lost as well.

So far, the discussion has operated on the basis of the assumption that merchants would have an incentive to block comparison shopping services if they charge higher than normal prices. Strangely, some merchants may have had an incentive to block it if they charged lower than normal prices. As we all know, merchants sometimes advertise a "loss leader," and offer to sell a particular good at an unprofitable price. Merchants do this in order to lure consumers into the store where they either may be attracted to more profitable versions of the same good (leading, in the extreme case, to "bait and switch"), or in the hope that the
consumer will spy other, more profitable, goods to round out the market basket.

You can explain this merchant behavior in different ways, either by talking about the economics of information, locational utility, myopic consumers generalizing incorrectly on the basis of a small number of real bargains, or about temporary monopolies caused by the consumer's presence in this store as opposed to another store far away.

It may be that merchants blocking BargainFinder did not want consumers to be able to exploit their loss-leaders without having to be exposed to the other goods offered simultaneously. Without this exposure the loss-leaders would not lure buyers to other, higher-profit, items, but would simply be losses. The merchant's ability to monopolize the consumer's attention for a period may be the essence of modern retailing; the reaction to BargainFinder, at least, suggests that this is what merchants believe.

The growing popularity of frequent buyer and other loyalty programs also suggests that getting and keeping customer attention is important to sellers. Interestingly, this explanation works about equally well for the "kindly service" and "loss leader" explanations--the two stories that are consistent with the assumption that the CD market was relatively efficient before BargainFinder came along.

3. Browsing Is Our Business

More important and perhaps more likely is the possibility that BargainFinder and other shop-bots threaten merchants who are in the "browsing assistance" business. Some online merchants are enthusiastically attempting to fill the role of personal shopping assistant. Indeed, some of the most successful online stores have adapted to the new marketplace by
inverting the information equation.

Retail stores in meatspace ("meatspace" being the part of life that is not cyberspace) provide information about available products--browsing and information acquisition services--that consumers find valuable and are willing to pay for, either in time and attention or in cash. Certainly meatspace shopping is conducive to unplanned, impulse, purchases, as any refrigerator groaning under kitchen magnets will attest. Retail stores in cyberspace may exacerbate this: what, after all, is a store in cyberspace but a collection of information?

CDNow, for example, tailors its virtual storefront to what it knows of a customer's tastes based upon her past purchases. In addition to dynamically altering the storefront on each successive visit, CDNow also offers to send shoppers occasional email information about new releases that fit their past buying patterns.

One can imagine stores tailoring what they present to what they presume to be the customer's desires, based on demographic information available about the customer even before the first purchase. Tailoring might extend beyond showcasing different wares: taken to the logical extreme it would include some form of price discrimination based on facts known about the customer's preferences, or on demographic information thought to be correlated with preferences. (The U.S. and other legal systems impose constraints on the extent to which stores may generalize from demographic information: for example, stores that attempt race-based, sex-based, or other types of invidious price variation usually violate U.S. law.)

A critical microeconomic question in all this is how consumers and manufacturer/sellers exchange information in this market. Both consumers and sellers have an interest in encouraging the exchange of information: in order to provide what the consumer wants, the
sellers need to know what is desired and how badly it is wanted. Consumers need to know what is on offer where, and at what price. A shop-bot may solve the consumer's problem of price, but it will not tell him about an existing product of which he is unaware. Similarly, CDNow may reconfigure its store to fit customer profiles, but without some external source of information about customers this takes time, and requires repeat visitors.

Indeed, it requires that customers come in through the front door: all the reconfiguration in the world will not help CDNow or E-bay if customers are either unaware that they would enjoy its products, or if the customers' only relationship with CDNow is via a shop-bot or a meta-site.

The retail outlet in the average mall can plausibly be described as a mechanism for informing consumers about product attributes. The merchant gives away product information in the hopes that consumers will make purchases. Physical stores, however, have fixed displays and thus must provide more or less identical information to every customer. Anyone who looks in the window, anyone who studies the product labels, or even the product catalogs, receives the same sales pitch.

Indeed, some of the more interesting recent writing on the micro-economics of virtual retailing suggests that what is really at stake is a war for the customer's attention--a war for eyeballs. Certainly, the rush to create "portals" that, providers hope, will become the surfer-shopper's default homepage on the Internet suggests that some large investors believe eyeballs are well worth having. So too does the tendency of successful early entrants in one product market to seek to leverage their brand into other markets.

It may be that the "dynamic storefront" story is the Internet's substitute for the kindly service story. If so, then the rise of agent-based shopping may well be surprisingly
destructive. It raises the possibility of a world in which retail shops providing valuable services are destroyed by an economic process that funnels a large percentage of consumer sales into what become commodity markets without middlemen: people use the high-priced premium cyberstore to browse, but then use BargainFinder to purchase.

To appreciate the problem, consider Bob, an on-line merchant who has invested a substantial amount in a large and easy to use "browsing" database that combines your past purchases, current news, new releases, and other information to present you with a series of choices and possible purchases that greatly increase your chances of coming across something interesting. After all, a customer enters seeking not a particular title, and not a random title, but a product that he or she would like. What is being sold is the process of search and information acquisition that leads to the judgment that this is something to buy. A good on-line merchant would make the service of "browsing" easy--and would in large part be selling that browsing assistance.

In this browsing is our business story there is a potential problem: browsing assistance is not an excludable commodity. Unless Bob charges for his services (which is likely to discourage most customers and especially the impulse purchaser), there is nothing to stop Alice from browsing merchant Bob's website to determining the product she wants, and then using BargainFinder to find the cheapest source of supply. BargainFinder will surely find a competitor with lower prices because Bob's competitor will not have to pay for the database and the software underlying the browsing assistance.

If so, then projects like BargainFinder will have a potentially destructive application, for many online stores will be easy to turn into commodity markets once the process of information acquisition and browsing is complete. It would be straightforward to run a market in kitchen gadgets along the lines of the BargainFinder, even if much of the market
for gadgets involves finding solutions to problems one was not consciously aware one had. First free-ride off of one of the sites that provides browsing assistance to discover what you want, then open another window and access BargainFinder to buy it.

Students and other people with more time than money have been using this strategy to purchase stereo components for decades: draw on the sales expertise of the premium store, then buy from the warehouse. But the scope and ease of this strategy is about to become much greater.

To merchants providing helpful shopping advice, the end result will be as if they spent all their time in their competitors' discount warehouse, pointing out goods that the competitors' customers ought to buy. The only people who will pay premium prices for the physical good--and thus pay for browsing and information services--will be those who feel under a gift-exchange moral obligation to do so: the "sponsors" of NPR. Thus cyberstores that offer browsing assistance may find that they have many interests in common with the physical stores in the mall--which fear that consumers will browse in their stores, and then go home and buy sales tax-free on the Internet.

4. Collaborative Filtering

Collaborative filtering provides part of the answer to the information exchange problem. It also provides another example of how information technology changes the way that consumer markets will operate. In their simplest form, collaborative filters such as FireFly bring together consumers to exchange information about their preferences. The assumption is that if Alice finds that several other readers--each of whom also likes Frisch, Kafka, Kundera and Klima but gets impatient with James and Joyce--tends to like William Gass, the odds are good that Alice might enjoy Gass's *On Being Blue* as well.
In the process of entering sufficient information about her tastes to prime the pump, Alice adds to the database of linked preference information. In helping herself, Alice helps others. In this simplest form, the collaborative filter helps Alice find out about new books she might like. The technology is applicable to finding potentially congenial CDs, news, web sites, software, travel, financial services and restaurants--as well as to helping Alice find people who share her interests.

At the next level of complexity, the collaborative filter can be linked to a shop-bot. Once Alice has decided that she will try *On Being Blue* she can find out who will sell it to her at the best price.

The truly interesting development, however, comes when Alice's personal preference data is available to every merchant Alice visits. (Leave aside for a moment who owns this data, and the terms on which it becomes available.) A shop like CDNow becomes able to tailor its virtual storefront to a fairly good model of Alice's likely desires upon her first visit. CDNow may use this information to showcase its most enticing wares, or it may use it to fine tune its prices to charge Alice all that her purse will bear--or both.

Whichever is the case, shopping will not be the same.

Once shops acquire the ability to engage in price discrimination, consumers will of course seek ways of fighting back. One way will be to shop anonymously, and see what price is quoted when no consumer data is proffered. Consumers can either attempt to prevent merchants and others from acquiring the transactional data that could form the basis of a consumer profile, or they can avail themselves of anonymizing intermediaries who will protect the consumer against the merchant's attempt to practice perfect price discrimination.
by aggregating data about the seller's prices and practices. In this model, a significant fraction of cyber commerce will be conducted by software agents who will carry accreditation demonstrating their credit-worthiness, but will not be traceable back to their progenitors.

Thus potential legal constraints on online anonymity may have more far-reaching consequences than their obvious effect on unconstrained political speech. In some cases, consumers may be able to use collaborative filtering techniques to form buying clubs and achieve quantity discounts like Mercata. Or consumers will construct shopping personas with false demographics and purchase patterns in the hope of getting access to discounts. Business flyers across America routinely purchased back-to-back round trip tickets that bracket a Saturday night in an attempt to diminish airlines' abilities to charge business travelers premium prices. Airlines, meanwhile, have invested in computer techniques to catch and invalidate the second ticket.

Consumers will face difficult maximization problems. In the absence of price discrimination, and assuming privacy itself is only an intermediate good (i.e., that consumers do not value privacy in and of itself), the marginal value to the consumer of a given datum concerning her behavior is likely to be less than the average value to the merchant of each datum in an aggregated consumer profile. If markets are efficient, or if consumers suffer from a plausible myopia in which they value data at the short-run marginal value rather than long-term average cost, merchants will purchase this information leading to a world with little transactional privacy.

Furthermore, the lost privacy is not without gain: every time Alice visits a virtual storefront that has been customized to her preferences, her search time is reduced, and she is more likely to find what she wants--even if she didn't know she wanted it--and this is ever more
true the more information the merchant has about her.

The picture becomes even more complicated once one begins to treat privacy itself as a legitimate consumer preference rather than as merely an intermediate good. Once one accepts that consumers may have a taste for privacy it no longer becomes obvious that the transparent consumer is an efficient solution to the management of customer data. Relaxing an economic assumption does not, however, change anything about actual behavior, and the same tendencies which push the market towards a world in which consumer data is a valuable and much-traded commodity persist.

Indeed, basic ideas of privacy are under assault. Data miners and consumer profilers are able to produce detailed pictures of the tastes and habits of increasing number of consumers. The spread of intelligent traffic management systems, video security and recognition systems and the gradual integration of information systems built into every appliance will eventually make it possible to track movement as well as purchases. Once one person has this information there is, of course, almost no cost to making it available to all.

Unfortunately, it is difficult to measure the demand for privacy. Furthermore, the structure of the legal system does not tend to allow consumers to express this preference. Today, most consumer transactions are governed by standard-form contracts. The default rules may be constrained by state consumer law, or by portions of the Uniform Commercial Code, but they generally derive most of their content from boilerplate language written by a merchant's lawyer. If you are buying a dishwasher you do not get to haggle over the terms of the contract, which (in the rare case they are even read) can be found in small print somewhere on the invoice.
Although it is possible to imagine a world in which the Internet allows for negotiation of contractual terms even in consumer sales, we have yet to hear of a single example of this phenomenon, and see little reason to expect it. On the contrary, to the extent a trend can be discerned, it is in the other direction, towards the "web wrap" or "clip wrap" contract (the neologism derives from "shrinkwrap" contracts, in which the buyer of software is informed that she has agreed to the terms by opening the wrapper) in which the consumer is asked to agree to the contract before being allowed to view the web site's content. Indeed, the enforcement of these agreements is enshrined in law in the proposed, and very controversial, Uniform Computer Information Transactions Act <http://www.law.upenn.edu/bll/ulc/ucita/cita10st.htm>.

D. The Next Economics?

We have argued that assumptions which underlie the microeconomics of the invisible hand fray when transported into tomorrow's information economy. Commodities that take the form of single physical objects are rivalrous and are excludible: there is only one of it, and if it is locked up in the seller's shop no one else can use it. The structure of the distribution network delivered marketplace transparency as a cheap byproduct of getting the goods to their purchasers. All of these assumptions did fail at the margin, but the match of the real to the ideal was reasonably good.

Modest as they may be in comparison to the issues we have left for another day, our observations about microfoundations do have some implications for economic theory and for policy. At some point soon it will become practical to charge for everything on the world wide web. Whether it will become economically feasible, or common, remains to be
seen. The outcome of this battle will have profound economic and social consequences.

Consider just two polar possibilities. On the one hand, one can envision a hybrid gift-exchange model, in which most people pay as much for access to web content as they pay for NPR, and in which the few who value an in-depth information edge or speed of information acquisition pay more. At the other extreme, one can as easily foresee a world in which great efforts have been made to reproduce familiar aspects of the traditional model of profit maximization.

Which vision will dominate absent government intervention depends in part on the human motivation of programmers, authors, and other content providers. The invisible hand assumed a "rational economic man," a greedy human. The cybernetic human could be very greedy, for greed can be automated. But much progress in basic science and technology has always been based on other motivations besides money. The thrill of the chase, the excitement of discovery, and the respect of one's peers have played a very large role as well, perhaps helped along by the occasional Nobel Prize, Knighthood for services to science, or a distinguished chair; in the future "Net.Fame" may join the list.

Government will surely be called upon to intervene. Adam Smith said that eighteenth-century "statesmen" could in most cases do the most good by sitting on their hands. The twenty-first century "stateswomen" will have to decide whether this advice still applies once the fit between the institutions of market exchange and production and distribution technologies has decayed.

We suspect that policies which ensure diversity of providers will continue to have their place. One of the biggest benefits of a market economy is that it provides for sunset. When faced with competition, relatively inefficient organizations fail to take in revenue to cover
their costs, and then they die. Competition is thus still a virtue, whether the governing framework is one of gift-exchange or buy-and-sell--unless competition destroys the ability to capture significant economies of scale.

The challenge for policy makers is likely to be particularly acute in the face of technological attempts to recreate familiar market relationships. Just because markets characterized by the properties of rivalry, excludability, and transparency were efficient does not mean that any effort to reintroduce these properties to a market lacking them necessarily increases social welfare. Furthermore, in some cases the new, improved, versions may provide more excludability or transparency than did the old model; this raises new problems. Holders of intellectual property rights in digital information, be they producers or sellers, do have a strong incentive to re-introduce rivalry and excludability to the market for digital information.

1. Increasing Excludability

It appears increasingly likely that technological advances such as "digital watermarks" will allow each copy of a digital data set, be it a program or a poem, to be uniquely identified. Coupled with appropriate legal sanctions for unlicensed copying, a large measure of excludability can be restored to the market. Policy makers will need to be particularly alert to three dangers.

First, technologies which permit excludability risk introducing socially unjustified costs if the methods of policing excludability are themselves costly.

Second, as the example of broadcast television demonstrates, imperfect substitutes for
excludability themselves can have bad consequences that sometimes are difficult to anticipate.

Third, over-perfect forms of excludability raise the specter that traditional limits on excludability of information such as "fair use" might be changed by technical means without the political and social debate that should precede such a shift.

We counsel caution: In the absence of any clear indication of what the optimum would be, the burden of proof should be on those who argue that any level of excludability should be mandated. This applies particularly to information that is not the content being sold but that is instead about the current state of the market itself. There is a long tradition that information about the state of the marketplace should be as widely broadcast as possible. We cannot see any economic arguments against this tradition.

In particular, reforming the law to give sellers a property right in information about the prices that they charge appears extremely dangerous. There has never in the past been a legal right to exclude competitors from access to bulk pricing data. It is hard to see what improvement in economic efficiency could follow from the creation of such a right in the future.

2. Increasing Rivalry

It is somewhat harder to imagine how rivalry might be recreated for digitized data without using an access system that relied on a hardware token of some sort. Rivalry can be reintroduced if access to a program, a document or other digital data can be conditioned on access to a particular smartcard or other physical object. Perhaps a cryptographically based
software analog might be developed that relied on some secret that the purchaser would have a strong incentive to keep to herself. In either case, a form of rivalry results, since multiple users can be prevented from using the data simultaneously.

But imposing rivalry where it is not naturally found means imposing a socially unnecessary cost on someone. The result may look and feel like a traditional market, but it cannot, by definition, carry the "optimality" properties markets have possessed in the past. The artificial creation of rivalry ensures that many users whose willingness to pay for the good is greater than the (near-zero) marginal cost of producing another copy will not get one.

Policy makers should therefore be very suspicious of any market-based arguments for artificial rivalry.

3. Increasing Transparency

It might seem that anything which encourages transparency must be good. Indeed, all other things being equal, from the point of view of consumers, merchants selling products that can survive scrutiny, and the economy as a whole, increases in the transparency of product markets are always a good thing. The issue, however, is to what extent this logic justifies a transparent consumer.

The answer is fundamentally political. It depends on the extent to which one is willing to recognize privacy as an end in itself. If information about consumers is just a means to economic end, then there is no reason for concern. If, on the other hand, citizens perceive maintaining control over facts about their economic actions as a good in itself, some sort of governmental intervention into the market may be needed to make it easier for this
preference to express itself.

4. The Next Economics?
We have focused on the ways in which digital media undermine the assumptions of rivalry, excludability, and transparency—and have tried to suggest that the issue of transparency is at least as important, complicated, and interesting as the other two. In so doing we have been forced to slight important microeconomic features of the next economy. We have not, for example, discussed the extent to which the replacement of human salespeople, travel agents, and shop assistants will affect the labor market.

The consequences may be earth-shaking. For about two centuries starting in 1800 technological progress was the friend of the unskilled worker: it provided a greater relative boost to the demand for workers who were relatively unskilled (who could tighten bolts on the assembly line, or move things about so that the automated production process could use them, or watch largely self-running machines and call for help when they stopped) than for those who were skilled. The spread of industrial civilization was associated with a great leveling in the distribution of income. But there is nothing inscribed in the nature of reality that technological progress must always boost the relative wages of the unskilled.

Nor have we addressed potentially compensating factors such as the looming disaggregation of the university, a scenario in which distance learning bridges the gap between elite lecturers and mass audiences, turning many educational institutions into little more than degree-granting standards bodies, with financial aid and counseling functions next to a gym, (just maybe) a library. While this may benefit the mass audience, it has
harmful effects on one elite: it risks creating an academic proletariat made up of those who would have been well-paid professors before the triumph of "distance learning" in the lecture hall.

Along a number of dimensions, there is good reason to fear that the enormous economies of scale found in the production of non-rivalrous commodities are pushing us in the direction of a winner-take-all economy. The long-run impact of the information revolution on the distribution of income and wealth is something that we have not even begun to analyze.

Similarly, we have completely ignored a number of interesting macroeconomic issues. Traditional ideas of the "open" and "closed" economy will have to be rethought on sectoral grounds. Once a nation becomes part of the global information infrastructure, its ability to raise either tariff or non-tariff walls against certain foreign trade activities becomes vanishingly small. Nations will not, for example, be able to protect an "infant" software industry. It will be hard to enforce labor laws when the jobs telecommute away.

National accounts are already becoming increasingly inaccurate as it becomes harder and harder to track imports and exports. Governments are unable to distinguish a personal letter with a picture attached from the electronic delivery of a $100,000 software program. Monetary and financial economics will also have to adapt.

Traditionally the field of economics has always had some difficulty explaining money: there has been something "sociological" about how tokens worthless in themselves get and keep their value that is hard to fit with economists' underlying explanatory strategies of rational agents playing games-of-exchange with one another. These problems will intensify as the nature and varieties of money changes. The introduction of digital currencies suggests a
possible return of private currencies. It threatens the end of seigneurage, and raises questions about who can control the national money supply.

The market system may well prove to be tougher than its traditional defenders have thought, and to have more subtle and powerful advantages than those that defenders of the invisible hand have usually listed. At the very least, however, defenders will need new arguments. Economic theorists have enormous powers of resilience: economists regularly try to spawn new theories—today evolutionary economics, the economics of organizations and bureaucracies, public choice theory, and the economics of networks. We will see how they do.

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Within national borders, that is. Migration across national borders is more restricted today than ever before.


In Britain at least. Inhabitants of west Africa or India in Adam Smith's day had very good reason to dispute such a claim.


When the Wall Street Journal sells a Berkeley economics professor an annual subscription to its e-version, does it envision that a user's identification-and-password could would be used in one day to access the e-version by the professor at work, by a research assistant working from home on the professor's behalf, and by the professor's spouse at another office? Probably not.


That excludability is a very important foundation for the market is suggested by the fact that governments felt compelled to invent it. Excludability does not exist in a Hobbesian state of nature: the laws of physics do not prohibit people from sneaking in and taking your things, the police and the judges do. Indeed, most
of what we call "rule of law" consists of a legal system that enforces excludability: enforcement of excludability ("protection of my property rights," even when the commodity is simply sitting there unused and idle) is one of the few tasks that the theory of laissez-faire allows the government. The importance of this "artificial" creation of excludability is rarely remarked on: fish are supposed to rarely remark upon the water in which they swim. See Brad Cox, Superdistribution: Objects as Property on the Electronic Frontier (New York: Addison Wesley, 1996).

In large part because the government did not restructure property rights to help them. Had the government made the legal right to own a TV conditional on one's purchase of a program-viewing license, the development of the industry might well have been different. And such a conditioning of legal right would have been technologically enforceable. As British billboards used to say: "Beware! TV locator vans are in your neighborhood!"


It is worth noting that in the debate over Microsoft in the second half of the 1990s virtually no one proposed a Federal Operating System Commission to regulate Microsoft as the FCC had regulated the Bell System. The dilemmas that had led to the Progressive-era proposed solution were stronger than ever. But there was no confidence in that solution to be found anywhere.


See generally http://www.gnu.org/ (free software) and http://www.opensource.org/ (open source generally).


A useful corrective to some of the hype is Kathryn Heilmann et al., "Intelligent Agents: A Technology and Business Application Analysis," haas.berkeley.edu/~heilmann/agents/#I

In January 1997, BargainFinder shopped at nine stores: CD Universe, CDNow!, NetMarket, and GEMM, IMM, Music Connection, Tower Records, CD Land, CDworld, and Emusic. A sample search for the Beatles White Album in January 1997 produced this output:

I couldn't find it at Emusic. You may want to try browsing there yourself.

CD Universe is not responding. You may want to try browsing there yourself.

$24.98 (new) GEMM (Broker service for independent sellers; many used CDs, imports, etc.)
I couldn't find it at CDworld. You may want to try browsing there yourself.

$24.76 Music Connection (Shipping from $ 3.25, free for 9 or more. 20 day returns.)

CDNow is blocking out our agents. You may want to try browsing there yourself.

NetMarket is blocking out our agents. You may want to try browsing there yourself.

CDLand was blocking out our agents, but decided not to. You'll see their prices here soon.

IMM did not respond. You may want to try browsing there yourself.


Interview with Tedd Kelly, executive director of e-college bid org, consultants for educational resources and research. 1 Nov 1999.


For example, consider: "Technology has set into motion dazzling challenges to market mechanisms whose free market dynamism is being impeded by anti-competitive handcuffs imposed by participants and sanctioned by regulators. A free market is nurtured by a culture of disclosure and equal access to information that fuels rather than fetters the marketplace. The dangers are real and the opportunities abundant. The efficiency and expanse of an unburdened open market is limitless. Tear down the barriers to competition, remove the obstacles to greater innovation, spotlight all conflicts of interest, and unleash the flow of timely and accurate information, and our markets--like never before--will be driven by the power and the brilliance of the human spirit." SEC Chairman Arthur Levitt, "Quality Information: The Lifeblood of Our Markets" http://www.sec.gov/news/speeches/spch304.htm (delivered October 18, 1999)