

Economics and Electronic Commerce

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For economists who study markets—whether wholesale or retail, goods or services, commodities or highly differentiated products—these are extraordinary times. The Internet and related technologies have caused the costs of many kinds of market interactions to plummet. As with any dramatic technological change, the most obvious and earliest effects are incremental: we find easier and less costly ways of doing the things we are already doing. Over time, however, the shifts are more drastic: we discover that we can do entirely new things, or completely restructure the way in which certain business activities are carried out.

Such long-term impacts of technological change are always hard to forecast, but that task is especially difficult in the case of e-commerce, where markets are currently very far from equilibrium. In the “land rush” to secure Internet real estate, to gain first-mover market position and other advantages, many firms are pursuing strategies that are properly interpreted as the payment of one-time, largely sunk entry costs. In some cases the focus of these expenditures is on “customer acquisition,” through pricing that is not likely to be sustainable, while in others it is building infrastructure to achieve minimum efficient scale. These expenditures—fueled by inflows of venture capital—may represent reasonable investments for a chance of a future stream of profits that might accrue to the

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resulting market positions. Still, short-run vigorous competition *for* markets as well as *in* markets makes it difficult to sort out long-run impacts.

In addition, off-line “bricks and mortar” firms are just awakening to the threats and opportunities from electronic commerce, and are beginning their own on-line initiatives. These traditional firms bring tremendous strategic assets: brand names, established geographic locations, and the fulfillment infrastructure required to get the product from a warehouse into the hands of the customer. The e-commerce choices that they make will have a powerful effect on the ultimate shape of the market.

Amidst these changes, business schools and others are struggling to adapt their curricula. Some instructors have gone so far as to argue that “traditional” economic analysis and tools are of little value in analyzing electronic commerce. As a colleague of one of the authors put it: “Everything we’ve been teaching the MBAs is now wrong.” We disagree. By way of introducing this symposium, we use the lens of standard microeconomics to examine how electronic commerce is likely to create value in the economy, which economic agents are most likely to capture the value that is created, and how e-commerce may lead to the reallocation of existing rents.

Creating Value Through Electronic Commerce

The Internet creates value by vastly lowering the cost of transferring many types of information, on a one-to-one, one-to-many, or many-to-many basis. In cases where the product itself is information, the potential for value creation is enormous. Financial transactions, both banking and investing, are probably the most important examples of transactions where no physical product is involved. There have also been drastic changes in many other information services in recent years: for example, ticketing for travel or entertainment, daily industry newsletters, health and child care advice, and document retrieval.

When the transaction involves “atoms” as well as “bits,” but the cost of moving the physical goods is low compared to the value of the good, the reach of the Internet is far greater than the historical alternatives. For example, on-line classified ads and consumer-to-consumer auctions make it feasible to search across many cities, states, and even countries to purchase a unique item that the buyer will cherish. The ability of consumers to address queries to these electronic databases make it possible to search through millions of listings nearly instantaneously to find the items of interest. The main consequence of the increased reach is the improvement in matching of buyers and sellers, especially in previously very inefficient markets like that for used consumer durables (the market served by eBay).

Even in cases in which the physical costs of transportation are high, the superiority of the Internet as an information transmission channel is leading to an increased separation of the flow of goods and information. For example, the variety of automobile purchase intermediaries and information services on the web has changed the

process of buying a car in the United States and, increasingly, in other countries.¹ In the labor markets, where large numbers of buyers and sellers may be very geographically dispersed, screening of job applicants has similarly been changed.

While information from Internet interaction will remain less personal than human interaction, it has several characteristics that make it potentially much more valuable in many circumstance. The first is the low cost of providing very detailed content. Investors, for example, now have ready access to live and recorded interviews with chief executive officers, filings reports of stock market analysts, and filings with the Securities and Exchange Commission. The extreme scale economies in providing such content to many consumers separate it from almost all other information transmission, and become more important with the size of the potential market to be served.

Second, the Internet allows for effective asynchronous communication, so this information access can take place at any time the investor desires, even in the middle of the night. Asynchronous communication is especially valuable when widely differing time zones are involved, as is increasingly common in the global economy.

Third, the Internet allows considerable flexibility in dealing with information, with far greater interactivity and search capability than, say, catalogs or menu-driven telephone information (the Internet precursor that was born only a decade or so ago and is already disappearing). One aspect of this flexibility is vastly reduced costs of customizing the service. Examples include on-line booksellers, such as Amazon.com, which make recommendations of likely books of interest tailored to the characteristics of the customer, or Babycenter.com, which by knowing the stage of pregnancy of an expectant mother, is able to provide individually tailored information and products.² While none of these approaches to personalizing the service is as, well, personal as dealing with a salesperson one-on-one, they are vastly cheaper and can be made available to many more people.

Value can be created with Internet communication either through finding ways of reducing costs or, on the demand side, by improving the match between buyer preferences and the goods they purchase. Indeed, the technology will often embrace changes that span both the cost and the demand side.

Starting with the cost side, an important and somewhat surprising finding by many firms is that cost savings on distribution are potentially very large. Despite the relative inefficiency of delivering goods directly to the home, there are so many sources of cost savings from direct delivery that for many items supplying direct to the consumer is less expensive than doing so through a store. The sources of cost savings include the reduction of handling within the store (unpacking, stocking and maintaining shelves, and such), theft (which can easily account for 3 percent of the sales of a retailer), rent (low-cost distribution centers replace expensive

¹ See Zettelmeyer and Scott Morton (2000) for an analysis of the effect of the new auto information and referral services on pricing and competition in auto retailing.

² For more on Babycenter.com, see the Stanford Business School case, "Babycenter," at (http://www.gsb.stanford.edu/CEBC/education/e_course/cases_e_com.htm).

urban or suburban real estate), and selling costs (automated and tele-sales replace relatively expensive in-store salespeople). In addition, e-commerce sales to consumers have thus far effectively been given preferred tax treatment, a situation that seems unlikely to continue in the long run.

In the business-to-business domain, there are also large potential cost savings from a better distribution process. When firms automate purchasing from other companies, some of the savings to firms comes in the form of volume discounts, which represents a shifting of rents rather than aggregate cost savings. The efficiencies from replacing paper ordering (typically estimated to cost about \$50 per transaction) with electronic ordering are significant as well. Moreover, when there are several separate entities (firms or divisions) in the supply chain, improving information flows can lead both to lower levels of inventories as well as better matching of supply and demand.³

Over time, it seems likely that e-commerce and the Internet will bring greater direct changes in the processes of production. In the case of services, specific functions can be parceled out to areas that are less expensive or have a time zone advantage. Software projects in which code is handed off to software engineers in India at the end of a business day in the United States are a well-known example. However, the possibilities extend to other business functions. For example, Sun Microsystems set up a site that enables programmers to bid to fix customers' software problems. Many low-skilled, labor-intensive tasks, such as check processing, will tend to flow to regions with a low cost of labor.

The key impediments to capturing the cost savings of e-commerce and the Internet will probably not involve technical issues, but rather inertial forces that relate more to organizational issues, the importance of compatibility with legacy systems, and non-technological transactions costs. For example, "collaborative replenishment" schemes in which the supplier accepts responsibility for ensuring that its items are in stock on the retailer's shelves, require a significant restructuring in information flows, incentives, and roles and responsibilities. Such changes are time-consuming and costly and even more difficult across the boundaries of firms than within a single firm. In addition, if communication across firms is to work well, each industry must undertake a great deal of work to agree on specific information templates tailored to that industry. As with most consensus standards processes, these are often lengthy and political.

Turning to the demand side, there are several aspects to the value created by matching tastes to existing goods: an improvement in information about the

³ While the Internet provides a superior technology to what has heretofore been available, technology has been available for a long time to enable firms and their suppliers to coordinate electronically. Electronic data interchange over proprietary networks has been used for decades. The web holds significant advantages over EDI: both fixed and variable costs are lower, the web is easier to use, and it is a more flexible and richer medium. But electronic coordination of information did exist on a considerable scale before the web. For more on electronic data interchange see the Stanford Business School case, "QRS Corporation," at (http://www.gsb.stanford.edu/CEBC/education/e_course/cases_e_com.htm).

available goods and services; an improvement in access to these goods; and the ability to customize goods to fit the tastes of buyers.

Information about goods comes from the availability of a wide range of on-line catalogs, but also from on-line reviews, product comparison engines, and in some cases like music, software, and books, even on-line samples. The Internet also has potential for using histories of consumer purchase behavior to suggest future purchases, or bundles of purchases, of which consumers might otherwise have been unaware. Of course, the undesirable consequences of direct marketing are likely to increase as well, although the ratio of plausibly desired to largely undesired unsolicited offers might increase.

The potential for creating value by improving access to goods arises from the tremendous costs of maintaining inventories in a wide variety of products across geographically dispersed outlets, coupled with high search and transportation costs for consumers, which results at present in a great deal of compromising on product attributes. In contrast, on-line stores benefit from enormous economies of centralized inventories. A company like The Gap, which has close to 2000 stores in the United States alone, can carry inventory to meet demand in every style, size, and color combination at much lower cost when it does so at a small number of distribution centers than when it attempts to do so on a store-by-store basis.

Of course, exploiting these economies of centralized inventories presupposes that buyers are familiar with the range of products or can easily make choices from only electronically-provided information, a dubious assumption when issues of fit, touch, taste, smell, sound quality, or even real-world appearance, are issues. Anyone who has tried to examine an item closely over the Internet realizes that the medium still falls frustratingly short in the realm of direct observation. This shortcoming will improve in some aspects as bandwidth costs decline, but the medium seems likely to be limited to visual and aural information for a long time to come. The same impediments are present in the growing business-to-business marketplaces for inputs; they are likely to work well for well-understood standardized products, but still face significant obstacles in facilitating transactions for specialized goods where the customizing information cannot be transferred easily in digital formats that the Internet can currently accommodate.

One solution to this issue is likely to be hybrid stores which provide a showroom function—carrying a very broad range of items, but few of each particular item—coupled with an on-line delivery capability. In the case of apparel, for example, a store might ensure that it has at least one, but probably not many, of each size and color. Shoppers can then make their appropriate product selection at the showroom. The shopper can at the same time, while at the store, order the product for later delivery. But with the Internet, the shopper can defer the decision, perhaps to compare with other stores' offerings, and order later through a website. Reordering of a known product can be done without any visit to the showroom at all. This hybrid approach could also address the fact that consumers often don't want to wait even a day or two to receive their purchase. It seems quite likely that hybrid stores will offer to complete transactions at the store during the

customer's visit, but with limited selection and possibly with a price premium. Companies such as Urbanfetch and Kozmo.com have arisen to address this need by offering immediate local delivery of goods ordered by phone or over the Internet, but they have not yet been highly successful at the business-to-consumer level.

If purchase and fulfillment are to be separated in this way, organizational and interfirm incentives will have to be significantly altered. Current incentive mechanisms like commissions, bonuses tied to store sales, and profit-sharing schemes are all predicated on the notion that actual sales are a signal of unobservable sales effort. If sales effort in a showroom pays off in on-line sales, and if the connection to the sales effort is hard to establish, it becomes difficult to induce sales effort using performance-based incentives. So far, on-line sales are still a small fraction of in-store sales, so this issue has not been very important. But some stores are experimenting with compensating store managers based on Internet sales originating from the area around the store, on the theory that some in-store sales effort is responsible for at least some of the on-line sales. Such methods, however, are crude, and significant effort is likely to be put into finding better ones.

More generally, as with almost any new channel for manufacturer-to-consumer distribution, the market must establish mechanisms for responding to the channel conflicts that arise. Some clothing manufacturers, for instance, have refused to sell their products over the Internet, or to allow retailers to do so, so as to prevent the free rider problem between "showroom" retailers, who allow consumers to check out the product in person, and purely Internet retailers, who can operate with much lower overhead. This problem is hardly new, but the Internet makes it potentially more pervasive, and at least one common response, exclusive retail territories, may be harder to implement.⁴

Notice that, both on the cost and the demand sides, most of these sources of value creation involve a "distribution revolution" rather than a manufacturing one. While the web has changed the way in which computers, other consumer electronics, books, and apparel are distributed, the way that they are made has been, so far, much less affected. The stunning example of the custom-manufacture and direct delivery of personal computers by Dell Computer Corporation illustrates that this is not inevitable. Dell's experience suggests that changing the way that goods are made can also yield significant cost savings and improvements in the match between buyer preferences and the goods they purchase. Before Dell, the standard business model in the personal computer market was to forecast demand in aggregate and by model, produce in batches, distribute through wholesalers and retail, and then use inventory and price changes to buffer mismatch between supply and demand. However, Dell takes orders first, allowing customers considerable choice among the attributes of the product, and then produces to order.

Significant opportunities exist in other sectors as well. In the case of automobiles, for example, many economic forces are pushing in the direction of "Dell-

⁴ Gertner and Stillman (2000) and Carlton and Chevalier (2000) examine this channel conflict problem in detail.

izing” the industry—that is, providing web-enabled customized manufacture with direct delivery to the home. A large fraction (by some estimates a third) of the final cost of a car is comprised of distribution costs. Many consumers end up compromising on options because of what is available on the dealer’s lot. Few consumers relish the buying process itself.⁵

However, one of the important lessons from Dell’s experience is that much more is required than simply grafting a new electronic distribution process onto an existing manufacturing one. Automobiles are currently made in batch processes, so that the typical delay from order to manufacture is of the order of three weeks (Toyota) to eight weeks (General Motors). Moreover, although it has long been possible to get a built-to-order car through a dealer, the vast majority of consumers (around 85 percent) prefer to take a car off the lot than to wait. If value is to be created from electronic commerce in the manufacture as well as the distribution of goods, unlocking that potential is likely to require significant restructuring of manufacturing. Consequently change of this sort is likely to occur relatively slowly.

Capturing Value and Reallocating Rents

At first blush, many industry segments for trading goods on the Internet appear to have the characteristics of perfectly competitive market structures. Entry costs seem low. The costs of setting up a website are fairly modest and if fulfillment is outsourced or kept fairly simple, infrastructure costs can be limited. Moreover, the cause of low price entrants is aided by the existence of “shop bots” and other intelligent agents that seek out and order offerings by price.⁶

Despite these attributes, on-line markets seem to be characterized by both price dispersion and increasing market concentration. Of course, analysis of competition and prices on the Internet runs into the disequilibrium critique that we mentioned earlier. “Introductory” pricing in the hope of building long-term market share, and low-price strategies that have not yet yielded profit, and may not ultimately be viable, have significant presence on the Internet landscape. At the other end of the price distribution, some goods are being offered at prices that yield few, if any, transactions. Still, price dispersion, even in the long run, could reflect differentiation in nonphysical attributes of the purchase experience.

Whether differentiation that is simply in the site itself (such as superior look-and-feel or product information) could lead to sustainable price dispersion will depend on website “stickiness.” Can consumers easily separate the decisions of

⁵ The impact of the Internet on automobile distribution in the United States is discussed in the Stanford Business School case, “Disintermediation in the U.S. Automobile Industry,” at (http://www.gsb.stanford.edu/CEBC/education/e_course/cases_e_com.htm).

⁶ Brynjolfsson and Smith (2000) investigate the effect of shop bots on price competition. Clay, Krishnan and Wolff (2000) and Goolsbee (2000) examine competition over the Internet (and with sales channels) in the book and computer markets, respectively.

what to purchase from where to purchase, since “locations” are just a click or two apart? Or is the utility of buying from a single vendor, avoiding unfamiliar sites and vendors, sufficient for consumers to forego even simple electronic search for low prices? We suspect that for most consumers, nonpecuniary aspects of the purchase experience (such as trustworthiness, after-sales support and service, reliability of delivery, likelihood of in-stock and accuracy of in-stock forecast) can create a logical and emotional attachment between consumer and site that is consistent with some degree of price dispersion. In the business-to-business realm, there are parallel stickiness issues stemming from the interface between the B2B websites and a company’s other electronic systems. Economies of scale in shipping and delivery, especially for consumers, produce a similar incentive toward concentrating purchases with fewer sellers.

Furthermore, many retail websites attempt to create stickiness, as well as value, through customization. They create lists of the customer’s past purchases that allow the customer to make repeat purchases easily. They point out sales (or create customized sales, easily done in this electronic medium) on the products that the customer has previously purchased. They make recommendations for products the customer might like to try based on previous buying habits. Finally, and predictably, many retail sites are now experimenting with loyalty programs that explicitly reward a consumer for concentrating purchases with a single vendor.

Nonetheless, the observed degree of price dispersion on the Internet remains greater than many find explainable by these factors. It remains to be seen how much of it survives in equilibrium despite the apparent greater “proximity” of stores in cyberspace than in the physical world. If sellers succeed in differentiating their products or retail channels, prices are likely to differ not only across sellers, but within a seller for different buyers. Price discrimination is, on the one hand, more easily facilitated when sellers can retain and quickly access detailed information about the customer’s buying habits, and on the other hand, more easily undermined when the customer can use intelligent shopping software to find the best price available (including possibly hiding the identity of the buyer). At this point, it is difficult to predict where the balance between these effects will ultimately reside in equilibrium. And, as is well-known, the welfare effects of such discrimination are ambiguous, as is the impact on the equilibrium allocation of rents (for instance, see Varian, 1989).

This use of the electronic information gathered by e-commerce retailers (and, increasingly, by conventional stores) is already quite controversial, as Amazon.com recently discovered when it was accused of offering lower prices to new customers compared to customers with long buying histories at Amazon (Streitfeld, 2000). Interestingly, Amazon responded to the charge by claiming that it was actually varying prices *randomly* as a method of estimating the price elasticity of demand for each item it sells, a practice that has its own fascinating welfare and rent-allocation effects.

At a more fundamental level, the argument that low entry costs will lead to dissipation of rents earned by e-commerce sellers may be overly simplistic. On-line firms whose strategies depend on differentiating their offerings with more accurate, responsive, and reliable fulfillment and after-sales support generally find that their

operations involve much more than a website and simple fulfillment operation. The infrastructure that is required—sophisticated fulfillment technology, efficient call centers, websites that offer accurate in-stock information, order tracking, comparison engines and product configurators—creates significant increasing returns. So too do the economies of centralized inventories and the economics of logistics (for example, providing distribution centers located reasonably close to customers). Moreover, where reputation for reliability and trustworthiness are important, brand development and maintenance costs also give rise to fairly conventional increasing returns. Finally, many of the resources being developed for the web are informational ones and naturally exhibit increasing returns. As firms come to compete along these dimensions, the level of sunk costs necessary to be a player in the market is likely to rise endogenously, as suggested by Sutton (1991) in the distant pre-web past.

Many market segments of electronic commerce may also prove subject to demand-side increasing returns. Probably the most important of these arises because buyers want to be where the sellers are, and vice versa. Aggregation of consumer product reviews may also prove a source of increasing returns; that is, buyers interested in the views of others would rather visit a site with many opinions than a few. More generally, almost any aspect of electronic commerce where community is important (chat, message boards, and so on) benefit from demand-side increasing returns. The market segment of payment clearinghouses are subject to very strong increasing returns in both the off-line and on-line world, as parties to both sides of the transaction desire common (and few) methods of transacting financially.

The equilibrium market structures that result will determine who captures the value that is created for three reasons. The first is the usual one: namely, that horizontal market structure matters, even though the relationship between market structure and performance is likely to be different in the on-line world because of lower search costs and the relative unimportance of “location” on the one hand, but potentially higher switching costs on the other hand.

The second reason is that for most goods and services, the on-line and off-line worlds are (at least imperfect) substitutes for one another. Consequently, competition in the on-line world will put pressure on pricing in the off-line world. This was clearly seen in the brokerage industry, where on-line brokers first affected discount off-line brokers and ultimately even their “full service” counterparts. Brown and Goolsbee (2000) have demonstrated the same phenomenon in the life insurance market.

The third reason is that vertical market structure matters. In the early stages of electronic commerce, the firms that dominate the gateways to commerce and channels, in particular the portals (firms like AOL and Yahoo) but also to a lesser degree the shopping bots (sites like MySimon) and to an even lesser degree the search engines (such as Lycos and Google), are able to extract some of the value created through the fees they are able to charge for the positioning they give to competing sites. (“Anchor tenancy” on a shopping site on AOL can cost tens of millions of dollars over a few years, for example). However, if market concentration increases to the point that each market segment is dominated by a small number of competitors, those firms are likely

to become household names, so that consumers can easily bypass other intermediaries, reducing the bite of the pie those intermediaries are able to take. Still, intermediaries are likely to continue to play an important role on the Internet. The amount of information on the web will certainly continue to grow, providing a continuing and important role for those who would help to organize it.

Concluding Remarks

Eventually, of course, electronic commerce will become just commerce. Along with telephone communication, railroad shipping, electrification of production processes, and other technologies, it will be another part of the critical backbone on which business relies. During the transition, however, e-commerce will drastically change the ability of firms to create and capture value and will lead to the restructuring of many markets, just as the previous technology shifts have.

The papers in this symposium examine the likely impact of e-commerce in a number of areas: Austan Goolsbee on taxes and the Internet, Brad Barber and Terry Odean on investing, David Autor on labor markets, David Lucking-Reiley and Daniel Spulber on business-to-business activity, and Yannis Bakos on retail e-commerce. They show that the microeconomic tools that have been used to analyze the impact on markets of previous technology shifts are equally applicable to the business world that is now adopting electronic commerce. They also demonstrate that the new entrepreneurial opportunities being created are raising important new research opportunities for those who can use the economic toolkit to gain insights into what the new economy will look like. This symposium is part of the beginning of that research agenda.

References

- Brown, Jeffrey and Austan Goolsbee.** 2000. "Does the Internet Make Markets More Competitive? Evidence from the Life Insurance Industry," NBER Working Paper 7996.
- Brynjolfsson, Erik and Michael D. Smith.** 2000. "The Great Equalizer? Consumer Choice Behavior at Internet Shopbots," mimeo.
- Carlton, Dennis and Judith Chevalier.** 2000. "Free Riding and Sales Strategies for the Internet," mimeo.
- Clay, Karen, Ramayya Krishnan and Eric Wolff.** 2000. "Pricing Strategies on the Web: Evidence from the On-line Book Industry," mimeo.
- Gertner, Rob and Robert Stillman.** 2000. "Channel Conflicts Between "Brick and Mortar" Retailers and Manufacturers that Sell Directly Over the Internet," mimeo.
- Goolsbee, Austan.** 2000. "Internet Competition with Retail: The Case of Computers," mimeo.
- Streitfeld, David.** 2000. "On the Web, Price Tags Blur," *Washington Post*, September 27, p. A01.
- Sutton, John.** 1991. *Sunk Costs and Market Structure: Price Competition, Advertising, and the Evolution of Concentration*. Cambridge, MA: MIT Press.
- Varian, Hal.** 1989. "Price Discrimination," in *Handbook of Industrial Organization*. R. Schmalensee and R. Willig, eds. Amsterdam: North Holland Press.
- Zettelmeyer, Florian and Fiona Scott Morton.** 2000. "Internet Car Retailing," National Bureau of Economic Research Working Paper #7961.