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The Microeconomic Impacts of E-Business on the Economy

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ABSTRACT

The adoption of e-business at the microeconomic level of retail, wholesale, and labor market transactions has an enormous impact on the performance of firms and the economic welfare of consumers and workers. This article reviews, in broad outlines, the economics of e-business, focusing on empirical research. The fundamental notion that e-business and adoption of ICT lowers the cost of transferring, storing, and processing information is used to organize the examination. E-business spheres of impact covered include B2C and B2B e-commerce, the labor market, and the productivity of firms. This article covers both the predicted impacts of e-business on the economy suggested by economic theory and evidence on their empirical magnitude, building a framework to understand why e-business has proliferated and what the economic benefits are. The article concludes with some of the new policy challenges accompanying the rewards from e-business in the economy, touching on issues of price discrimination, competition, and some disadvantages of new markets.

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THE MICROECONOMIC IMPACTS OF E-BUSINESS ON THE ECONOMY

INTRODUCTION

The use of information and communications technology (ICT) in business—the most expansive definition of e-business—is transforming the world economy.[1] E-business at the microeconomic level of retail, wholesale, and labor market transactions has an enormous impact on the performance of companies and the economic welfare of consumers and workers. The gains in efficiency and economic benefits at the microeconomic level exert influence all the way up to the macroeconomic level of GDP and fiscal and monetary phenomena. However, new policy challenges accompany the rewards from e-business in the economy.

The economics of e-business are shaped by the way that ICT lowers the cost of transferring, storing, and processing information (Borenstein & Saloner, 2001). When the cost of information falls, there are profound consequences for how firms conduct business with each other, with consumers, and with workers. This article covers both the predicted impacts of e-business on the economy suggested by economic theory and their empirical magnitude, building a framework to understand why e-business

[1] In this article we use the term "e-business" in its most general sense: any use of ICT by a firm to conduct its business. E-business as we use the term includes e-commerce, which is buying and selling over the Internet, but also any use of ICT to fill orders, service customers, procure inputs, or enhance the productivity of labor. Often e-business is defined more narrowly to mean the conduct of business over the Internet. One of the problems with such narrower definitions is that they unwarrantedly restrict the meaning of "electronic" (the "e" in e-business) to refer to the Internet. They also exclude most B2B e-commerce, the majority of which is still performed via non-Internet based EDI systems. It is perhaps also worth noting that the term "electronic mail" (if not "e-mail") predates the Internet.

has proliferated and what are the economic benefits. The economic gains from e-business not only stem from using existing resources more efficiently, but also from increasing growth and the creation of new products.

The main section of the article deals with the principal arenas in which the impacts of e-business on the economy play out. The arenas are defined by the type of interaction between economic primitives. The interactions are transactions in the case of economic actors or transformations in the case of economic goods. First is the business-to-consumer (B2C) channel, focusing on retail and financial transactions. Interactions among firms come next, both business-to-business (B2B) e-commerce and competition in the output market. A closer look at the market for one key input firms use, labor, provides a look at how e-business changes transacting between business and its workers. The main section concludes with the effect of e-business on firms' productivity—how efficiently the firm transforms its inputs into outputs. The next section looks at directions for future research, covering some of the new policy questions that e-business raises for the economy. Throughout, the emphasis remains on the microeconomic effects of e-business (see the companion article by Heil & Prieger (forthcoming) for the macroeconomic impacts).

BACKGROUND

Information is the key component of the modern economy. While pure knowledge is disembodied, transferring, storing, and processing information is costly

for firms and consumers. E-business has such a great impact on today's economy because ICT lowers the costs associated with information (Borenstein & Saloner, 2001). For businesses, information can be an output itself of the firm (e.g., a financial transaction involving no physical product), a direct input used to produce an output (e.g., data incorporated into geographical software), or an indirect input that is complementary to other inputs (e.g., communications technology that makes outsourcing of programming tasks feasible). For consumers, information flowing from businesses helps define both the set of products available and their attributes, and information flowing back to firms reveals customers' preferences. For workers, information is also a two-way channel. Workers want to reveal information about their capabilities to potential employers, and firms want to advertise openings and job characteristics.

Viewed through the lens of cost reduction, transformations of the production process enabled by e-business such as outsourcing, just-in-time inventory systems, and e-banking not only make sense but become predictable. Similarly, given the importance of information in search and matching markets such as consumer purchasing and the labor market, the advent of electronic intermediaries such as auction sites and online resume exchanges makes sense. Wherever the costs involved with transacting information are high, the gains from adopting e-business practices are highest and the market will naturally implement ICT there first.

Reduced informational costs can not only facilitate given transactions, but can expand the set of transactions included within a specific market. By lowering the

costs of bringing together geographically distant buyers and sellers, e-business increases the size of any given market. Larger markets make the trade of goods and services more reliable and efficient, in part because bigger markets often have lower average costs associated with them. However, the aggregation of information in larger markets is beneficial in its own right, especially compared to the bilateral negotiation between economic agents that e-business may replace. The inefficiency of bilateral negotiation—that some mutually beneficial trades may not occur—is due to the asymmetric information (e.g., on the reservation prices) held by the parties. Thicker markets mitigate such inefficiencies (Vulkan, 2003).

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Interactions between consumers and firms

B2C interactions allow better matching of consumers to products and services (Santarelli & D'Altri, 2003). Search tools for buyers, shopbots, retail auction sites such as eBay, and online brand communities such as websites for aficionados of Japanese *manga* comics (Jang, *et al.*, 2008) all lower the consumer's cost of searching for goods and prices. As the cost of search falls, consumers response with a substitution effect and search more (Su, 2008), improving the quality of the match to a product. On the seller's side, e-commerce allows the collection of more information about customers than is provided by "old economy" retail channels. Such information is valuable for firms, allowing them to price discriminate, differentiate their product, push tailored marketing messages to consumers based on past behavior, and offer mass cus-

tomization of their product lines (e.g., Dell's system of allowing buyers to choose features of their computers) (Vulkan, 2003).

B2C e-commerce over the Internet has grown steadily since its inception in the 1990's. Official estimates in the US peg e-commerce at $135 billion in 2008, which is 3.4 percent of total retail sales (US Dept. of Commerce, 2009). The official estimates are likely to be lower than the actual figures because the census misses many small "e-tailers".

Improved matching of customers to products has two impacts on market outcomes. In some markets e-commerce primarily lowers prices, while in others it spurs product differentiation and price discrimination (Bakos, 2001). Prices fall in some markets, particularly those for homogeneous goods, for two reasons. When it becomes cheaper for consumers to search among the prices of competing retailers, demand for any one seller's product becomes more elastic, retailers must compete more directly with each other on price, and prices fall. Ellison and Ellison (2009) find striking evidence that lower search costs due to Internet search technologies can make demand highly elastic. The computer parts online seller they study faced demand elasticity of as high as 33 for certain of its memory products.

Prices also drop due to disintermediation. When e-commerce cuts middlemen out of the sales channel, such as when a customer directly buys books from Amazon or computers from Dell without visiting a physical store, then costs arising from wholesaling are avoided. While B2C e-commerce trades lower wholesaling costs for

increased shipping costs (since firms must individually transport products to the consumers' sites), often the savings are large. B2C practices reduce labor costs through elimination of retail floor sales help, reduce the need to carry inventory at multiple retail sites (which also reduces theft from inventory), and reduce real-estate rental costs (Brynjolfsson & Smith, 2000).

Prices for some goods have fallen greatly due to e-commerce. Brynjolfsson & Smith (2000) find that prices for books and CDs purchased on-line (inclusive of delivery charges and taxes) average 9-16 percent lower than prices at traditional stores. New product markets created by e-commerce, such as those for mp3 music downloads, electronic book sales, and software applications for smart phones, can be thought of as an extreme form of price decreases.[2] New goods potentially cause large economic benefits for consumers, although empirical measurement is scarce.

B2C e-commerce affects perhaps no other area more than the financial sector. The financial services sector provides a good example of how adoption of ICT enables entirely new retail business processes and methods (UNCTAD, 2007, ch. 5). E-banking and to a lesser extent e-trading have become the norm for many customers. The convenience of e-banking and e-payments for households and firms is matched by the cost reductions and efficiency gains on the other side of the transactions. Disintermediation in the securities brokerage industry, in which computers have re-

[2] The benefits created by a new good can be measured as the gain to consumer surplus from a price decrease from infinity (i.e., before introduction the good was not available at any price) to the market price after introduction of the good.

placed employees for many transactions, lowers costs and therefore puts downward pressure on the price of service. While the percentage of trades conducted online probably peaked during the dot-com boom in 2000, as of 2003, 10 to 20 percent of equity trades in the US are still executed online (RocSearch Ltd., 2006).

Interactions among firms

E-business has greatly changed how firms transact with each other as they purchase intermediate goods. Business-to-business e-commerce—interaction between firms that takes place electronically, including electronic data interchange (EDI) and Internet based auctions and exchanges—dwarfs the B2C sector. More than 80 percent of e-commerce worldwide and about 93 percent of e-commerce in the US is B2B.[3] Firms have enthusiastically adopted B2B e-commerce because of its great potential to lower the costs of procurement (Lucking-Reiley & Spulber, 2001). Cost savings come directly from freeing labor from the time-consuming process of non-electronic procurement methods, from the greater ease of finding suitable vendors and prices, and from the greater control that e-commerce lends to a firm's spending strategy (Vulkan, 2003). Phillips & Meeker (2000) estimate that processing a purchase order manually costs 8-18 times what online procurement costs. By lowering search costs, B2B e-commerce strengthens a business' control over its spending by reducing the cost of going "off contract" to procure inputs not available from its approved sup-

[3] The worldwide estimate is for 2002 (cited by Bertscheck, *et al.*, 2006). The US estimate is for 2006 (US Commerce Dept., 2008). Most B2B e-commerce in the US is done through proprietary EDI systems rather than over the Internet.

pliers. Vulkan (2003) claims that such maverick buying makes up 40 percent of procurement spending in the US, and that Internet-based automation of procurement should greatly reduce that amount.

Cost savings from B2B also come from a transformation of intermediation, as in B2C e-commerce. Brokers, content aggregators, auctioneers, dealers, and exchanges[4] are able to link larger markets via e-commerce—and to do it more efficiently—than can catalog-based or other non-electronic systems. Thus, in markets in which information plays a key role intermediation becomes more important (Lucking-Reiley & Spulber, 2001; Vulkan, 2003). In a study of a large sample of German firms, Bertschek, Fryges, & Kaiser (2006) find that B2B is more likely to be adopted by firms that use a knowledge-intensive production process, and by firms engaged in international business. The lower cost of effective intermediation can also change the structure of the firm through vertical disintegration, as it becomes more feasible to outsource some tasks of the firm that formerly were provided in-house (Lucking-Reiley & Spulber, 2001).

However, intermediation dealing with managing physical inventory becomes less important, as adoption of ICT improves inventory management (Bakos, 2001). Indeed, the manufacturing sector, where inventory costs can be large, is the largest

[4] Vulkan (2003) defines content aggregators as agents that connect buyers and sellers through direct negotiation in markets that would otherwise be fragmented. Content aggregators bring together buyers and sellers that are in the same industry but who trade in a variety of goods or services. Exchanges, in contrast, are for clearing the market for one particular good.

adopter of B2B in the US, with e-commerce composing about one-third of the value of total shipments (US Dept. of Commerce, 2008).

In summary, B2B e-commerce can improve a firm's productivity in many ways, and empirical studies bear this out (although one must always be wary of publication bias).[5] Bertschek, Fryges, & Kaiser (2006) find that investment in ICT improves labor productivity, but only for firms engaged in B2B e-commerce.[6] We return to the impact of e-business more generally on productivity in a later section. The economic benefits of B2B adoption can be significant for firms. In terms of the bottom line, Efendi, Kinney, & Smith (2007) find that firms adopting buy-side B2B systems increased average return on assets by nearly three percentage points and the average profit margin by 2.7 percentage points, relative to a matched sample of non-adopting businesses.

Interactions between firms and the labor market

Since information is of preeminent importance in labor markets, it is no surprise that e-business is profoundly transforming the labor market. The primacy of information stems from the matching aspects of the labor market: firms try to find capable employees without being able to observe their productivity before hiring, and workers search for jobs without knowing all possible openings and all job characteris-

[5] Other things equal, a study that finds a positive result (i.e., that e-commerce increases productivity) generally is more likely to be published in an academic journal than a study with a negative result (i.e., that e-commerce does not affect productivity). Thus, any specific empirical literature may provide a false consensus.

[6] They control for the endogeneity (non-random nature) of the firms' choices to use B2B.

tics. Given that e-business fundamentally lowers the cost of information, it has dramatically changed the process of matching workers to firms (Autor, 2001).[7] Information is also important in the labor market once a match is made. Reduced costs of transmitting information allows many labor services to be delivered to the firm over the Internet that were formerly required to be produced in house.

First generation e-business phenomena such as passive online resume exchanges, job postings, and applications for positions, as well as later generation services such as front-end e-recruiting websites married to back-end automated information processing, improve the efficiency of matching in the labor market (Autor, 2001; Nakumura *et al.*, 2009). More than two-thirds of workers look for jobs online now (Stevenson, 2009), and the relatively low cost of finding and screening applicants means that higher quality matches are possible (which raises labor productivity as well).[8] While direct evidence on how e-business improves matching quality is scarce, one study looking at an electronic labor intermediation program in Italy found that it increases the chance that an individual finds a job and improves matching quality, as

[7] Some impacts of lowering search costs may be negative. When application costs falls, firms may receive more low quality applications, which burden the screening process.

[8] However, online resume and job posting and other matching services do not necessarily allow risk to be shifted among parties in the labor market, as do some traditional forms of intermediation. For example, internships transfer risk (defined as bearing the cost of an unexpected outcome) from the employer to the employee, while internal labor markets with long-term contracts or on-the-job training transfer risk in the other direction (Harrington & Velluzzi, 2008).

evidenced by higher wages and worker satisfaction (Bagues & Sylos Labini, 2009).[9] This is in contrast to offline centralized clearinghouses, which have not been found (in at least one case study) to increase wages (Niederle & Roth, 2009).

Whether Internet searching directly reduces the length of unemployment spells is currently an open question. Kuhn & Skuterud (2004) conclude that workers using the Internet to look for jobs are unemployed for just as long, and maybe even longer, than others. The authors suggest that searching on the Internet for jobs may send a negative signal about the worker, although such an effect is likely to lessen as Internet searching becomes ubiquitous. Stevenson (2006) notes that the analysis of Kuhn & Skuterud (2004) does not include workers who switch directly from one job to another (i.e., those with unemployment durations of zero). Truncating the zero-length unemployment spells in the data artificially skews their sample, since Stevenson (2009) finds that Internet users are more likely to change jobs directly. Stevenson (2009) provides a final bit of evidence that online searching leads to better matching: even after controlling for sample selection bias, workers who use the Internet to search are 15 percent more likely than non-users to have moved to a new job within a month.

Cheaper and more efficient communications between workers and their employers creates expanded opportunity to outsource labor tasks. Call centers located

[9] The program, *AlmaLaurea*, is an online clearing house for information concerning college graduates' characteristics and coursework. *AlmaLaurea* sells the information to employers (Bagues & Sylos Labini, 2009).

off site (and perhaps offshore), remote monitoring of equipment, and telecommuting are all made possible by ICT (Autor, 2001). Görg, Hanley, & Strobl (2008) find from plant-level data for Irish firms that international outsourcing increased the firms' productivity, even after controlling for factors causing firms to choose outsourcing. Kaiser (2004) finds that telecommuting in the manufacturing and trade sectors leads to large increases in labor productivity (measured by firms' profits, value added, and revenue per worker).

Productivity at the firm level

How efficiently a firm produces a good or service depends on interactions among the firm's inputs and outputs. E-business can increase productivity by changing how the firm transforms inputs into outputs, as the previous section on labor shows. For example, the use of ICT reduces the cost of coordinating workers assigned to different tasks, enabling firms to intensify the specialization of labor celebrated by Adam Smith in the pin factory.[10] Use of ICT and adoption of e-business has measurably increased labor productivity, and we turn to some of the available evidence now. The estimates here are from firm-level studies, and are necessarily specific to the industry and technology examined.[11] The companion article by Heil & Prieger (forth-

[10] See book 1, chapter 1 of Adam Smith's *An Inquiry into the Nature and Causes of the Wealth of Nations*.

[11] Some other studies come to other conclusions (see chapter 3 of UNCTAD (2007)), but the results covered here are representative of the bulk of the literature, which generally finds positive productivity impacts from adoption of ICT and e-business.

coming) on the macroeconomic impacts of e-business covers the general macroeconomic impacts of e-business on productivity.

The use of computers and other ICT increases productivity in the short run by deepening the capital available to workers, and in the longer run by increasing total factor productivity (Brynjolfsson & Hitt, 2002).[12] Maliranta & Rouvinen (2003), looking at Finnish firms, find that equipping all employees with computers in particular increases labor productivity by 18 percent in manufacturing and 28 percent in services. Adopting computers also spurs firms to invest in complementary intangibles (Brynjolfsson & Yang, 1999), such as software, new incentive systems, training, patterns of interaction within the firm, and other new business practices. In fact, Koellinger (2006) argues that the productivity-enhancing effects of ICT are contingent upon firms investing in these additional complementary intangibles. Increasing the stock of such "organizational capital" related to ICT adoption is one reason that total factor productivity increases in the long run from e-business. Matteucci *et al.* (2005) investigate the dynamic payoffs from investing in any form of ICT, finding that it increased the average productivity of German manufacturing firms over the next three years by 36 percent (but had no effect on service industry productivity).

A business typically uses computers to communicate within and without the firm via networks. Evidence from a US manufacturing sample shows that the use of

[12] We discuss e-commerce and total factor productivity further in the companion article on macroeconomic impacts of e-business.

computer networks such as LANs, EDI, and the Internet in a firm increase labor productivity by five percent (Atrostic & Nguyen, 2005). The Finnish study mentioned above finds that granting an employee Internet access at work increases his productivity by three percent in the service sector, but has no significant effect in manufacturing (Maliranta & Rouvinen, 2003). Perhaps the dominance of EDI over Internet-based e-procurement in the manufacturing sector accounts for this result. Other studies that examine Swedish firms find that access to broadband is associated with increases in productivity of 3.6 percent for manufacturing and services firms (Hagén & Zeed, 2005) and 62 percent for ICT firms (Hagén, *et al.*, 2007).

A final, smaller collection of studies looks specifically at the impact of e-commerce on the productivity of workers. Several studies find that when firms buy inputs online they have higher productivity, and that when they sell output they have lower productivity (Criscuolo & Waldron, 2003; Farooqui, 2005). Criscuolo & Waldron (2003) measured the size of the productivity change at an increase of seven to nine percent for buying online and a decrease of five percent for selling online. However, the negative results for selling online may merely reflect a price effect, since these studies measure output in monetary value, online sellers have lower prices, and the impact is identified by comparing adopters and non-adopters of e-commerce.

FUTURE RESEARCH DIRECTIONS

Much of the available research regarding e-business and the economy dates from the expansionary years of the dot-com bubble.[13] Consequently, some of the early rosy expectations and prognostications for e-business in general (and B2C e-commerce in particular) have not been borne out. For example, new intermediaries in the online air travel booking industry have not been as successful as the earliest research foretold (Klein & Loebbecke, 2003). Furthermore, despite the potential for—and demonstration of—e-business to lower the costs of information in ways that greatly enhance economic welfare, the benefits come mixed with issues that future research must address to inform public policy.

Price Discrimination and Obfuscation

E-business allows firms to price discriminate as never before. Price discrimination can run counter to the impetus for prices to fall created by increased consumer price-searching and cost reductions from disintermediation. With no physical price tags or postings available for all customers to see, it is inexpensive for a firm to offer different prices to different consumers. In a notorious episode from the dot-com boom years, Amazon offered differing prices to consumers for identical products, claiming after discovery and negative publicity that it was randomly adjusting prices in order to estimate the elasticity of demand (Streitfeld, 2000). By collecting information on past customer behavior, or through creating switching costs for consumers

[13] For example, in researching this article we found it much easier to find predictions from 2000 on what the online trading market would look like in five years than to find actual statistics for 2005.

through lock-in to a particular e-tailer, targeted differential pricing also becomes an option.

While evidence on online price discrimination is rare, research is available on the closely related phenomena of price dispersion among firms. Clemons, Hann, & Hitt (2002) find that airfares vary by as much as 18 percent among online travel agents. Brynjolfsson & Smith (2000) find even greater dispersion of online prices for books and CDs, and Walter, Gupta, & Su (2006) show that price dispersion is present across a broad range of e-commerce goods. However, recent evidence indicates that as online markets mature, price dispersion may decrease (Bock, Lee, & Li, 2007).

While charging customers different prices is not illegal in itself, the antitrust laws in the US limit companies from using price discrimination as an anticompetitive device. While some commentators do not believe that e-business raises new policy concerns regarding price discrimination (Edwards, 2006), research on whether any given discriminatory practice enabled by e-business is anticompetitive will be an active field, evolving as business employ ever newer methods to eke out more profits from consumers.

Price discrimination is one reason that price levels in some online markets have remained higher than simple theories of search costs and e-commerce predicted. Obfuscation, the deliberate attempt by online sellers to confuse buyers and defeat

price search technology, is another reason (Ellison & Ellison, 2009).[14] Through obfuscation, which includes complicating product descriptions, creating multiple product versions, and hiding the cost of add-ons, an e-tailer can raise search costs, decrease consumer learning, and raise profits. Ellison and Ellison (2009) document that online retailers successfully obfuscate to raise markups on computer parts. Future research should seek to document the prevalence of obfuscation and the evolving arms race between consumer search technology and sellers' increasingly sophisticated attempts to obfuscate.

New Markets: Always a Good Thing?

When e-business opens entirely new markets the potential for value creation can be large. However, not all new markets opened by e-business provide benefits unalloyed with any disadvantages. Bakos, *et al.* (2005) find that financial trades performed online are cheaper but of lower quality (i.e., result in worse transaction prices) than those executed by traditional brokers. Additional research is needed to monitor whether the performance gap between full and discount service brokers (and in other markets) persists as online trading markets become more sophisticated and efficient.

E-trading, by giving an individual greater control over the information, timing, and execution of trades, can also imbue some traders with an illusion of control over

[14] One form of obfuscation is *shrouding*, the hiding of information from consumers that would allow them to know the full price inclusive of shipping, add ons, or related fees. Gabaix and Laibson (2006) show that shrouding can raise markups and persist in competitive equilibrium when there are myopic consumers.

random outcomes in the market (Barber & Odean, 2001). Similarly, providing more information to investors can create an illusion of knowledge. Barber & Odean (2001) cite research showing that giving consumers more information causes their forecasting confidence to improve much more rapidly than their actual forecasting accuracy. Problems arising from consumers having *too much* information are much less common—or at least less commonly recognized—than the opposite case where consumers lack information about a product's characteristics or dangers, and raise thorny issues for public policy. More research is needed on the impact of the illusion of control on households' ultimate welfare before it can be known whether policymakers should be concerned.[15]

E-Commerce, Competition, and the Structure of Industry

While B2B changes how firms collaborate in the buying and selling of inputs from and to each other, e-commerce also affects how businesses compete against each other (Lucking-Reiley & Spulber, 2001). E-commerce can increase the economies of scale in intermediary markets, because many online markets such as auction sites require large fixed costs to set up but nearly no marginal transaction costs since the product (information) is intangible. Economies of scale can lead to domination of a market segment by a few large actors. Internet-based markets such as platforms for content aggregation and exchanges also exhibit network effects: having many traders on a platform increases market liquidity, which attracts even more traders to the plat-

[15] See Barber, *et al.* (2008) for a promising step taken in this direction)

form. The positive feedback in market share due to network effects often leads to "winner take all" outcomes in platform markets. Indeed, DIW Berlin (2008) finds that ICT use is associated with higher market shares in the chemical, retailing, and transport services sectors. Lucking-Reiley & Spulber (2001) point to the commodities futures market in early 20th century as an example of how economies of scale and liquidity concerns led to market dominance.

Even when economies of scale and network effects are less important, as may be the case in the retailing of physical goods, e-business adoption may still have anti-competitive effects (OFT, 2000). ICT lessens the cost of sharing information among competitors, which can facilitate (tacit or explicit) collusion. For example, competitors can use shopbots to check each others' prices to ensure no firm deviates from a tacit agreement to maintain high prices. Vulkan (2003) points out that since e-tailers often must explicitly allow shopbots to search their sites, opting in can constitute a commitment not to cut prices for competitors to observe. There is little solid empirical research yet that ascertains the importance of the competitive implications of e-business.

CONCLUSION

Information is the linchpin holding together today's worldwide economy. Anything facilitating the processing and flow of information is therefore supremely important. E-business, by lowering costs of transferring and storing information, now

affects nearly every aspect of commerce. This article has reviewed the main type of interactions that e-business affects: those between firms and consumers, those among firms, those between firms and labor, and the transformation of inputs into output (productivity). Available empirical evidence shows that the microeconomic impacts of e-business and ICT have often been large. The transformations of economic interactions wrought by e-business at the microeconomic level, in aggregate, have important implications for macroeconomic phenomena such as taxation and other fiscal policy, monetary policy, international trade, and national economic growth. Evidence regarding macroeconomic effects of e-business is reviewed in Heil & Prieger (forthcoming).

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KEY TERMS & DEFINITIONS

Disintermediation: The reduction or elimination of the use of market intermediaries that match producers to ultimate buyers in product markets or employers to employees in the labor market.

Elasticity of demand: A characterization of the sensitivity of the quantity demanded of a good to changes in price (in percentage terms).

Illusion of control: A term from psychology for the finding that people behave as if they can affect the outcome of random events.

Network effect: The effect whereby an economic agent's valuation of a product (e.g., a trading platform) increases with the number of consumers of the product (e.g., the number of other traders on the platform).

Off-contract procurement: A firm's purchase of inputs or materials from a source other than the approved supplier with which the firm has negotiated volume discounts or other concessions.

Price discrimination: The practice of charging different customers different prices, where the price differentials are not explained merely by differing costs of serving the customers.

Total factor productivity: Productivity growth not explained by increases in inputs such as capital and labor. TFP, as a residual, captures all other factors influencing growth, such as improved uses of the measurable inputs, general technological progress, and changes in policy and institutions.

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*This chapter was written while the first author was visiting the Federal Communications Commission. The views expressed in this chapter are those of the authors and do not necessarily reflect the views of the FCC or any of its Commissioners or other staff.