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# What Impact Will E-Commerce Have on the U.S. Economy?

*By Jonathan L. Willis*

In recent years, e-commerce has emerged as the fastest growing sector of the U.S. marketplace. Despite the contraction in the high-tech industry during the recent recession, firms have continued to enter and expand their presence in e-commerce, and consumers have increased the number of purchases made online. E-commerce currently represents a very small share of overall commerce, but it is expected to continue to expand rapidly in coming years. As e-commerce grows, so will its impact on the overall economy.

The primary route by which e-commerce will affect the economy at large is through its impact on productivity and inflation. Businesses and consumers that use e-commerce benefit from a reduction in costs in terms of the time and effort required to search for goods and services and to complete transactions. This reduction in costs results in higher productivity. An even larger increase in economy wide productivity levels may result from productivity gains by firms not engaged in e-commerce as they respond to this new source of competition. Continued expansion of e-commerce may also lead to downward pressure on inflation through greater competition, cost savings, and changes in price-setting behavior of sellers.

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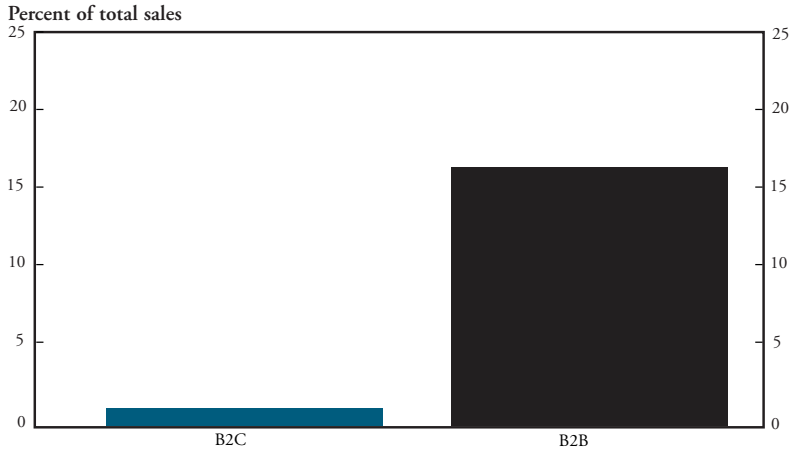
Recognizing e-commerce's potential impact on the economy is important for policymakers and forecasters as they project economic activity in the future. As e-commerce expands, it could further the trends in productivity growth and inflation that have been observed in recent years. Productivity growth was low in the 1970s and 1980s before increasing sharply in the second half of the 1990s. Inflation was high in the 1970s and early 1980s before beginning a steady decline. The causes of these well-documented changes, however, are not fully understood by economists. While these developments are partly due to fiscal and monetary policy actions, it is also possible that structural changes in the economy played a role. Increased e-commerce activity represents a structural change that could result in downward pressure on inflation over the next decade and, if not offset by monetary policy-makers, could lead to disinflation.

This article examines the economic factors that have contributed to the rapid growth of e-commerce and assesses how the future growth of e-commerce may affect the overall economy. Section I of the article describes the size and growth of e-commerce. Section II examines the factors that have contributed to its strong growth in recent years. Section III assesses implications of continued expansion of e-commerce for productivity growth and inflation. The article concludes that if e-commerce continues to grow rapidly, it could lead to an increase in productivity growth and downward inflationary pressure that persist for several years.

## **I. THE SIZE AND GROWTH OF E-COMMERCE**

Over the past decade, e-commerce has increasingly provided an alternative way for buyers and sellers to transact. The term e-commerce, which is short for electronic commerce, is the act of buying or selling goods, services, or information over an electronic network. Transactions are negotiated electronically and are completed when agreement is reached to transfer ownership of goods or rights to receive services or information for a specified price.

Until recently, analysis of e-commerce has been limited by a lack of data. In 1999, the Census Bureau began requesting data on e-commerce sales in its annual surveys of manufacturers, wholesalers, retailers,

*Chart 1***E-COMMERCE SALES IN 2002 RELATIVE TO TOTAL SALES**

Note: Total sales is a measure of the annual sales of manufacturers, retailers, and selected services surveyed by the Census Bureau.

Source: U.S. Census Bureau

and selected services and in its monthly survey of retailers. These surveys provide detailed data on the two primary types of transactions: business-to-consumer, or B2C, and business-to-business, or B2B.

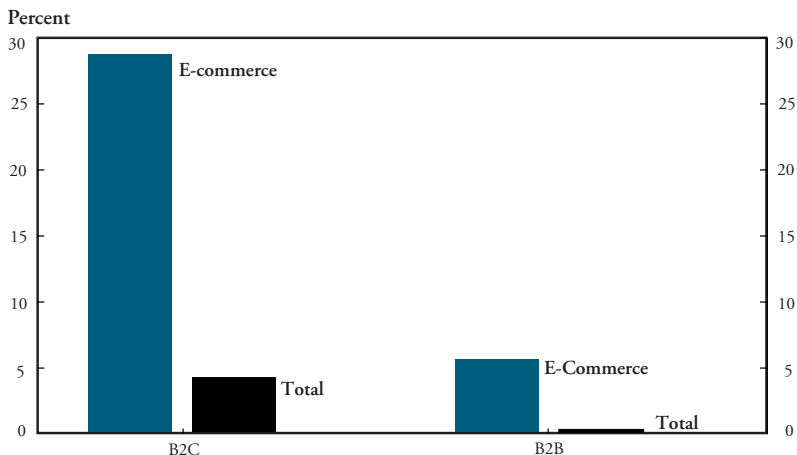
*B2C e-commerce*

Despite receiving the majority of media attention due to its recent rapid growth, B2C e-commerce represents only a small share of sales. B2C accounted for only 7 percent of e-commerce sales in 2002, the most recent year for which data are available (Department of Commerce 2004a). In terms of overall sales, B2C e-commerce comprised only 1.1 percent of total B2C commerce in 2002 (Chart 1). The growth of B2C e-commerce, however, far outpaced that of non-e-commerce. Between 1999 and 2002, B2C e-commerce grew 29 percent annually, while non-e-commerce grew 4 percent annually (Chart 2).

The development of B2C e-commerce has been fueled by a rapid increase in the number of people shopping on the Internet. First introduced for public use in the late 1980s, the Internet has quickly

Chart 2

## ANNUAL GROWTH OF E-COMMERCE AND TOTAL SALES FROM 1999 TO 2002



Note: Total sales is a measure of the annual sales of manufacturers, retailers, and selected services surveyed by the Census Bureau.

Source: U.S. Census Bureau

expanded from a network primarily used for e-mail communication into a place to engage in a wide variety of activities, including online shopping. As a result, the fraction of households with Internet access increased from less than 20 percent in 1997 to over 50 percent in 2001 (Department of Commerce 2002). Accompanying this surge in Internet usage, the percentage of individuals who made online purchases in recent years has also increased. Commerce Department surveys taken in 2000 and 2001 show that the number of people shopping online increased from 13 percent to 21 percent.

Evidence also suggests that the strong growth of B2C e-commerce has continued since 2002. While annual data for e-commerce is currently available only through 2002, the Census Bureau also reports a quarterly e-commerce series based on its monthly retail survey, which accounts for about half of B2C commerce. According to the most recent data, e-commerce retail sales grew 25 percent in the fourth quarter in 2003 from the year-earlier period, while total retail sales increased 6 percent over the same span. Dating back to the fourth quarter of 1999, e-commerce retail sales have jumped at an annual rate

of 34 percent. Thus, over a period including the most recent recession, growth of e-commerce in B2C retail sales has remained strong and stable.

Looking forward, rapid B2C e-commerce growth is expected to continue. Forrester Research, an independent technology research company, projects that B2C e-commerce will grow 19 percent per year through 2008. Jupiter Research, a research firm specializing in business and technology, forecasts a similar annual rise of 17 percent through 2008 for e-commerce retail sales. Based on these projections, the share of total consumer sales accounted for by e-commerce will increase from 1.1 percent in 2002 to nearly 4 percent by 2008.

### *B2B e-commerce*

B2B e-commerce accounts for the majority of e-commerce sales and has grown faster than non-e-commerce B2B sales. In 2002, B2B e-commerce comprised 93 percent of e-commerce sales. In terms of total sales, e-commerce accounted for over 16 percent of B2B sales in 2002 (Chart 1). From 1999 to 2002, B2B e-commerce grew 5.5 percent annually, while non-e-commerce sales were basically flat over this period (Chart 2).

As indicated by its larger size and slower growth, B2B e-commerce is a more developed means of exchange than B2C e-commerce. One of the reasons for higher levels of B2B e-commerce is that transactions are predominantly executed using electronic data interchange (EDI) networks rather than the Internet.<sup>1</sup> EDI networks were developed in the early 1970s, using telephone lines to transmit the electronic orders between businesses. Due in part to the introduction of EDI almost 20 years before the Internet, EDI is the dominant way of engaging in B2B e-commerce. Use of the Internet for B2B e-commerce, however, is becoming more common. Based on data from merchant wholesale trade, Internet e-commerce accounted for 14 percent of total e-commerce in 2002.

Private-sector estimates of B2B e-commerce beyond 2002 suggest that growth is strengthening. IDC, an information-technology consulting firm, projects that B2B e-commerce will grow about 45 percent annually between 2003 and 2006. EMarketer, a research

firm specializing in e-commerce and the Internet, provides a similar forecast of annual growth of 44 percent between 2002 and 2004. One of the main reasons for these strong growth projections following recent years of slow growth is that Internet e-commerce uses a lower cost and more flexible technology than EDI e-commerce. As a result, an increasing number of businesses are expected to transact via e-commerce.

## **II. FACTORS CONTRIBUTING TO THE GROWTH OF E-COMMERCE**

Assessing how continued growth of e-commerce will impact productivity and inflation requires an understanding of the underlying factors of e-commerce growth. At the most basic level, a new type of commerce, such as e-commerce, can emerge only if the incentives are sufficient for both buyers and sellers to engage in the new form of trade. For sellers, e-commerce provides several advantages over conventional ways of selling products, such as lower transaction costs, more efficient distribution, and greater market access. The primary benefits for buyers are that goods and services can be purchased easier, quicker, and often cheaper via e-commerce.

### *Factors benefiting sellers*

Advances in information technology have given e-firms—sellers engaged in e-commerce regardless of whether they also engage in conventional commerce—several advantages over those using conventional sales methods. E-firms incorporate key elements of bricks-and-mortar establishments (stores) and nonstore establishments (businesses that receive orders remotely, such as mail-order establishments) to develop businesses that operate efficiently and appeal to many customers. E-firms are able to transact with buyers at a lower cost, while providing customers with increased product selection and information along various dimensions.

In many ways, conducting business through e-commerce is similar to conducting business via mail or telephone. Transactions are negotiated remotely, and delivery services transport products to buyers. The

remoteness of the transaction provides several opportunities for cost savings. E-firms that transact only through e-commerce can locate in areas with low real estate costs and a low-cost workforce. They can centralize operations into a few warehouses as opposed to the network of stores necessary for a national bricks-and-mortar firm. Also, the lack of face-to-face interaction with customers reduces the need for a large workforce of salespeople.

The rapid growth of e-commerce is due in part to a significant cost advantage it provides e-firms due to its advanced use of information technology. The essential feature of e-commerce, the electronic transaction, can be completed for a much lower cost than a face-to-face transaction or processing of voice orders over the phone or written orders sent by mail or fax. In the case of B2B transactions, these savings can be significant for companies that routinely process large orders. For example, switching to e-commerce has cut average transactions costs for British Telecom from \$113 to \$8 (Phillips and Meeker). The savings can also be large for firms providing financial services. Lehman Brothers estimates that it costs \$1.27 for a bank teller to execute a transfer between bank accounts. That same transfer costs an estimated \$0.27 if conducted at an ATM, and only \$0.01 if conducted over the Internet (*The Economist*).

In addition to reducing transaction costs, e-commerce also can reduce delivery costs. The Internet has provided a low-cost delivery system for the distribution of digital goods. Increasingly, technology is making it more feasible for goods such as computer software, music, movies, and books to be delivered in a digital format. Services, such as financial services, are also increasingly being delivered electronically, eliminating costs associated with printing and mailing.

By conducting transactions via e-commerce, e-firms also are able to achieve cost savings through better management of supply chains. E-firms can integrate their sales transaction system directly with the production side of their business to limit the amount of inventories on hand, while still ensuring that sufficient inputs to production are available to fill current orders. This represents a savings to the company by lowering inventory holding costs and by limiting the potential cost of having to slow or shut down the production line should the firm run

out of inputs. Dell Inc., which generates about half of its revenues through sales on its website, has streamlined its production process such that its inventory level is limited to a four-day supply (Maguire).

Advertising costs also may be lower for e-firms. Many e-firms market their products electronically, often through a website, and benefit from buyers' increasing use of free search engines, such as Google and Yahoo, to search for products. Purchasers worldwide are now able to use such search engines to locate sellers and products in a matter of seconds, whereas firms without websites primarily rely on newspaper, television, and radio advertising to attract customers.<sup>2</sup>

E-commerce also allows sellers to provide diverse products and detailed information on those products in a way that has traditionally only been available from stores. E-firms can inexpensively provide extensive descriptions of products, visual displays of products including close-up views, and links to complementary products the consumer may want to purchase. In terms of product diversity, e-commerce allows firms to cheaply offer a large array of products for sale without the cost of adding pages to the production of a catalog. With increased product diversity, e-firms have the option of operating more like department stores. They can provide several different categories of goods and services for sale or partner with other firms to form a virtual shopping mall.<sup>3</sup>

### *Factors benefiting buyers*

Buyers also benefit from transacting via e-commerce. The ability to place digital orders remotely saves both on the time required to complete a transaction as well as the time spent searching for products. In addition, for the purchase of a specific product, the information technology driving e-commerce allows buyers to search for the lowest price or request bids for projects at little cost in terms of time and effort.

Through the use of information technology, the time spent searching for a product decreases. Computer-driven search engines allow buyers to search the inventories of thousands of stores in just seconds, whereas shopping at retail outlets requires much more time to visit stores, search through catalogs and newspaper advertisements, or call up sellers to locate the desired product. E-commerce also allows buyers to



search quickly across sellers for the lowest price for a specific product or service. For e-commerce, complex computer applications called shop-bots have been created to efficiently search for the price of a particular product at a variety of sellers. Using this technology, buyers can make price comparisons from five stores about ten times faster than by calling each store on the telephone (Brynjolfsson and Smith). Businesses also benefit from a more efficient process for requesting bids for projects. Through e-commerce, businesses can quickly post requests-for-quotes (RFQs) and receive bids to be evaluated, and the negotiation and final transaction stages can also be more efficiently processed over the Internet.

Transaction costs are greatly reduced for e-commerce purchases. For retail businesses purchasing a wide assortment of items to replenish inventories, orders can be efficiently sent electronically to a supplier over an EDI network or the Internet. In addition, numerous B2B e-firms have been established to provide the service of a middleman for buyers and suppliers in automating procurement and contract processes through the use of B2B exchanges. Through these exchanges, businesses can continue purchasing from their existing suppliers but benefit from increased efficiency in the transaction process. In addition, consumers benefit from not having to wait in line to check out at a store or be put on hold when placing an order from a catalog.<sup>4</sup>

### **III. IMPLICATIONS OF FUTURE E-COMMERCE GROWTH**

If buyers and sellers continue to increase their use of e-commerce, the overall economy is likely to be affected in two ways. First, cost savings achieved by e-commerce sellers will increasingly lead to higher productivity. Second, the combination of increased competition and cost savings will result in downward pressure on the price level and possibly inflation as many e-firms will charge lower prices than conventional sellers. Because of the small size of e-commerce, the largest impact on productivity and inflation in the near term will come from the response of firms not engaging in e-commerce as they face pressure to lower prices and increase productivity in order to remain competitive.

### *Impact on productivity*

As e-commerce continues to expand, its impact on aggregate productivity is likely to increase. E-firms use information technology extensively to reduce costs of transactions, inventory holdings, advertising, search, and transportation. These cost savings are achieved in part through a reduction in the amount of labor required for each business task. As a result, productivity, which is measured by output per hour of all workers, is likely to be higher on average for e-firms than for non-e-firms. E-commerce will make a larger positive contribution to overall productivity as it continues to expand in size relative to the rest of the marketplace, but this impact is likely to occur over a long horizon.

While it is difficult to calculate a precise measure of the productivity gains associated with e-commerce, several studies attest to the real and potential improvements that can be achieved. In an internal study, Cisco Systems attempted to calculate the savings achieved through the use of e-commerce and related Internet-based management improvements between 1994 and 1999 (McAfee). The cost savings were achieved through improvements to e-commerce, customer care, supply chain management, and workforce optimization leading to productivity increases. Cisco concluded that the accumulated cost savings in these areas over five years was equivalent to 5.3 percent of their 1999 revenue. Nearly 10 percent of the cost savings were attributable solely to workforce optimization, which represents the direct gain to productivity. In a study of the auto industry, the estimated cost savings over the next decade attributed to use of e-commerce and related Internet-based management improvements are approximately 13 percent of total production costs (Fine and Raff). While detailed estimates of actual productivity gains for the auto industry are not available, some of the cost savings will result in higher productivity.

For the economy as a whole, e-commerce is expected to make a positive contribution to productivity over the next several years. One study estimates that the existence of e-commerce and the Internet will add between 0.25 to 0.5 percentage point to productivity growth between 2001 and 2005 (Litan and Rivlin). This impact was estimated by examining the Internet-related gains to education, financial services,

government, healthcare, manufacturing, retailing, and trucking. Another study attributes a portion of the unexpectedly strong productivity growth since 2001 to advances in the ways companies and individuals use computers to conduct business with one another (Gordon). Recent innovations in software and communications technology, which are the essential elements necessary for e-commerce, have allowed businesses to realize the full potential benefits of the personal computer.

These estimates may in fact understate the cost savings and productivity gains that will be realized in coming years. Increased competition due to the expansion of e-commerce may lead to a faster pace of innovation as businesses attempt to distinguish their products from other competitors'. In the computer industry, such competition, which is not entirely a result of e-commerce, has contributed to large productivity gains as increasingly powerful computers are produced at a lower cost. Firms will also be under increasing pressure to incorporate cost-saving measures into their businesses to maintain profitability. Relatively less productive firms are likely to be forced out of business.

An additional impact of continued e-commerce growth on productivity may result from a composition shift among sellers. During the initial development of e-commerce, particularly with regard to B2C e-commerce, small firms with low overhead were best positioned to take advantage of the low-cost e-commerce marketplace. Larger retailers, such as department stores and discount retailers, faced more hurdles because of their scale of operations and thus required a much larger investment to replicate their retail shopping model in an e-commerce framework. Given the initial low level of demand for online shopping, it was not worthwhile for large retailers to engage in e-commerce. As a result, retailers without physical stores accounted for 75 percent of e-commerce retail trade in 2001.

In the longer run, bricks-and-mortar firms are likely to become a large presence in e-commerce for three reasons. First, as information technology continues to advance, it will become less costly to establish and maintain an e-commerce business. Second, large retailers such as Wal-Mart have built their business on a superior inventory acquisition and distribution model. They are able to achieve substantial cost savings by negotiating low prices from wholesalers due to the large quantities

they purchase. Third, they are able to shape the marketplace in which they operate. For example, Wal-Mart has required all of its wholesalers to use a designated Internet EDI network to reduce costs of transactions. This change will allow Wal-Mart to benefit from lower-cost B2B e-commerce transactions and pass part of the savings on to consumers, thereby increasing the competition faced by other sellers. These three factors will lead to a larger e-commerce market share for bricks-and-mortar firms.

Given the current small size of e-commerce, its largest impact on productivity in the near term is likely to occur mainly through its effect on conventional sellers. While the current size of this indirect effect on productivity of conventional sellers is unclear, the effect is likely to magnify as e-commerce continues to grow.

In the long run, the emergence of e-commerce will only affect the level, not the growth rate, of productivity. Any single cost saving achieved due to the use of e-commerce or due to increased competition from e-commerce would lead to a one-time increase in the productivity level. This in turn would only temporarily increase the growth rate of productivity. However, given that the improvements will only be realized gradually as e-commerce continues to grow, the growth rate of productivity could be increased for a decade or more. In addition, continued innovation is likely to lead to further improvements in coming years as firms learn how to best organize their business to facilitate transactions over the Internet.

### *Impact on inflation*

The continued development of e-commerce is also likely to have an impact on prices and inflation. Despite the limited history of e-commerce, there is increasing evidence that the price-setting behavior of e-firms differs from that of non-e-firms. The cost savings achieved by e-firms through the implementation of advanced technology has led to lower prices for many goods and changes in the frequency of price adjustments. These changes in price-setting behavior may contribute to lower inflation in the short run and the faster adjustment of prices in response to changing economic conditions. Increases in competition as

e-commerce grows may also lead to a lower price level and downward pressure on inflation. Over longer periods, the extent to which the realized inflation rate is lower will depend on the response of monetary policy.

Increased competition has put pressure on many e-firms to lower their prices. Price-sensitive buyers have been drawn to e-commerce because they can quickly execute price-comparison searches. In response, e-firms have been able to increase sales volume by lowering prices. These price reductions have been economically feasible because of the cost savings e-firms have achieved. The impact of these two elements, competition and cost savings, is strongest for standardized goods or commodities.

One example of e-commerce price competition comes from the retail market for books and compact discs, or CDs. Over the past ten years, these items have been two of the largest e-commerce retail sales products in part because they are very standardized. When purchasing a new book or CD, buyers do not have to be concerned about differences in product quality across sellers.<sup>5</sup> A recent study of sales of these items found that e-commerce prices were 9 to 15 percent lower than prices at conventional stores in 1998 and 1999 (Brynjolfsson and Smith). If buyers continue to switch from stores to e-firms, this differential will create downward pressure on the aggregate price level and thus temporarily dampen inflation.

The impact of e-commerce price competition on inflation is even stronger when non-e-firms respond by lowering their prices to match the actions of e-firms. In a recent study of term life insurance premiums, comparison shopping on the Internet was linked to lower prices for life insurance policies (Brown and Goolsbee). From 1992 to 1995, no link was identified between increased Internet usage and premiums for term life insurance. From 1995 to 1997, however, with the introduction of websites providing cross-company comparisons of term life insurance premiums, premiums dropped by 8 to 15 percent across *all* sellers.<sup>6</sup>

Another important implication of e-commerce for inflation involves the size and frequency of price changes. Many firms prefer to make large, infrequent changes in prices rather than smaller, more frequent adjustments. For the U.S. economy, the majority of firms changed prices at most once every four months between 1995 and

1997 (Bils and Klenow). This behavior contributes to persistence in the level of inflation, increasing the time it takes inflation to return to its initial level after an unexpected change. A higher level of inflation persistence implies that it takes longer for the economy to adjust to an economic shock. If firms make smaller, more frequent changes, then the economy is better able to self-correct following a shock.

A study comparing book and CD sales from e-commerce and conventional retailers found that e-firms adjust prices far more frequently and by smaller amounts than conventional retailers (Brynjolfsson and Smith). Using a dataset of approximately 1,000 price observations from e-firms between February 1998 and May 1999 and a similar sample from conventional stores, the authors found that e-firms made 86 changes of book prices of less than one dollar.<sup>7</sup> Stores made only 37 price changes of less than one dollar. An even more striking pattern emerged from CD prices. E-firms made 97 price changes of less than one dollar, while stores made no changes of that size. Given this pattern of more frequent, smaller price changes, e-firms appear to respond to shocks faster than conventional sellers. This behavior may already be contributing to evidence suggesting that inflation persistence has fallen in recent years (Willis). As e-commerce continues to expand, its contribution toward lower persistence should increase.

Prices for all goods and services sold via e-commerce, however, are not expected to fall as some firms use alternative tactics to offset the impact of increased competition. One commonly used tactic is price discrimination. Similar to conventional sellers, many e-firms distribute coupons to buyers who are most likely to respond to temporary discounts. Another method is the name-your-price transaction model used by sellers such as Priceline.com. Through this model, firms can sell excess inventory at a discount using a mechanism that limits the choices available to buyers. Given the constrained selection, only a subset of buyers are willing to make purchases at discounted prices. This means that the firm is able to charge higher prices to buyers who want more choice over product features, limiting the downward price pressure associated with competition.

In addition to price discrimination, many e-firms also attempt to increase profits by finding alternative ways of adding value for buyers. One method is through product differentiation. E-firms can charge

more for unique goods and services labeled with a specific brand if that item imparts value for the buyer. Even when selling a fairly standardized product, e-firms can provide customization features to buyers (Bakos). For example, in the computer industry companies have been successful by allowing buyers to select the exact features they desire for a computer. Through the advanced use of information technology, these companies have designed their operations to quickly assemble a customized computer and ship it directly to the customer. Buyers, in turn, are willing to pay higher prices for a customized computer than for a mass-produced machine.

As with the improvements to productivity, the impact of e-commerce on prices in the long run will only be on the level of prices, not on inflation. The increase in competition associated with the introduction of e-commerce should have a short-term impact limited to the time it takes for the market to fully develop. After the e-commerce market has stabilized, the overall effect from the introduction of e-commerce should be a permanent decrease in prices due to the increased competition. The drop in prices leads to a temporary decrease in inflation given an unchanged stance of monetary policy. Once the price decrease is complete, inflation will then be expected to return to its previous level. Longer-term decreases in prices could occur if e-firms continue to find new ways to cut costs, perhaps through new innovations in information technology. Also, new technologies could be introduced to improve the way buyers and sellers interact. To the extent that such improvements decrease transaction costs, they also would lead to lower prices and downward pressure on inflation. In the end, the amount of downward pressure on inflation will be determined by the impact of e-commerce on productivity.

#### **IV. CONCLUSION**

E-commerce has emerged as a new way to transact in the marketplace. Initially introduced as a means for businesses to efficiently place orders over private EDI networks, the introduction of the Internet has recently spread the benefits of transacting electronically to consumers as well. While currently representing only a small share of total transactions, e-commerce has grown rapidly in recent years.

Over the next decade, the impact of e-commerce on economic activity in the United States is likely to grow.

Inflation and productivity are two areas of economic activity that are likely to be affected by e-commerce. The cost savings achieved by e-firms has led to higher productivity, and productivity growth will continue with new innovations. The emergence of e-commerce has also made the marketplace more competitive, leading many firms to charge lower prices and creating downward pressure on inflation. In addition, improved use of information technology has allowed e-firms to respond more quickly to changes in the economy. Firms not engaging in e-commerce will also increasingly need to lower prices and improve their productivity to remain competitive with e-firms. Together, these changes may alter the behavior of inflation in response to an economic shock.

As the economy continues to evolve, the development of e-commerce represents a structural change that may influence economic activity over the next decade. Given economists' limited understanding of recent changes to trends in inflation and productivity, it is important to consider how future economic developments, such as the expansion of e-commerce, will affect the recent trends that have emerged. In particular, policymakers and forecasters should take into account the effects of e-commerce as they project economic activity going forward. Recent improvements in data collection for e-commerce will help in those efforts by facilitating better tracking of this developing sector.



## ENDNOTES

<sup>1</sup>An EDI transaction consists of the transmission of computer readable data in a standardized format over a private network between two businesses to facilitate the purchase of a good or service.

<sup>2</sup>To the extent that search engines are now increasingly charging fees for priority placement in search results, the advertising savings are lessened.

<sup>3</sup>For B2C e-commerce, one example of firms joining together into a virtual shopping mall is the merger of the online websites of Amazon, Babies R Us, Toys R Us, Marshall Fields, Target, and Office Depot into a joint retail website. For B2B e-commerce, B2B exchanges have been established to serve as specialized marketplaces for suppliers industries such as hospital, aerospace, defense, and steel.

<sup>4</sup>One disadvantage of e-commerce is that buyers must pay additional delivery costs, which are also incurred when purchasing from a nonstore business. A second potential disadvantage is uncertainty regarding the reputability of the seller. Due in part to buyers' concerns about interacting with fraudulent sellers, B2C e-commerce companies with strong brand names have been able to charge significantly more for products than less well-known businesses. For the book industry, Amazon.com charged an estimated \$2.49 more per book than generic e-commerce retailers in 1999 (Smith and Brynjolfsson).

<sup>5</sup>As mentioned in Section III, however, buyers do need to be concerned with the reputability of the sellers.

<sup>6</sup>This price decrease was estimated controlling for changes in mortality rates, unobserved differences across groups, and for other factors that may be spuriously correlated with Internet usage.

<sup>7</sup>The dataset consists of monthly prices for 160 items (80 books and 80 CDs) from February 1998 to May 1999 posted by e-commerce retailers and a similar sample from conventional stores.

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