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FEDERAL COMMUNICATIONS COMMISSION  
OFFICE OF THE SECRETARY

Ms. Magalie Roman Salas  
Secretary  
Federal Communications Commission  
445 12<sup>th</sup> Street, S.W.  
Washington, D.C. 20554

Re: Deutsche Telekom AG/VoiceStream Wireless, FCC IB Docket 00-187

Dear Ms. Salas:

The Computer & Communications Industry Association (CCIA) submits these comments in reference to the above-captioned proceeding in which Deutsche Telekom AG (DT) and VoiceStream Wireless Corporation (VoiceStream) have sought Federal Communications Commission (FCC) approval to transfer control of certain licenses and authorizations.

CCIA is an international association of technology, telecommunications, and Internet firms, representing a broad cross-section of the industry. Our members employ nearly a million workers and generate annual revenues in excess of \$300 billion. CCIA is dedicated to preserving full, free and open competition in domestic and international telecommunications markets.

CCIA supports the FCC's expressed pledge to "give close scrutiny to any merger involving foreign government-controlled providers."<sup>1</sup> We think it was important for the Commission to reassure all those concerned that criticism of the Commission for allegedly "rubber-stamping" transactions when the foreign-controlled firm is located in a World Trade Organization (WTO) member country is unfounded. In determining whether to grant the license transfers between VoiceStream and DT, the FCC now has the opportunity to reaffirm its commitment to a meaningful standard of review for this and future transactions involving firms in WTO-member countries. To this end, CCIA encourages the Commission to consider seriously the potential anticompetitive effects that may harm domestic businesses and consumers if an entity controlled or subsidized

<sup>1</sup> House Oversight Hearing on Foreign Government Ownership of American Telecommunications Companies, September 7, 2000 (prepared statement of Chairman William E. Kennard).

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by a government entity is allowed to compete indefinitely in the U.S. telecommunications market.

In a recent hearing before Congress on the foreign investment issue,<sup>2</sup> the Commission emphasized that under its 1997 Foreign Participation Order<sup>3</sup> there is a rebuttable presumption that mergers between U.S. companies and foreign-controlled firms in WTO-member countries are in the public interest. The Commission insisted it would take a case-by-case approach to all applications involving U.S. companies and foreign-controlled firms to determine whether granting the application would have negative competitive effects on the U.S. telecommunications industry. During the hearing, the Commission committed to using its current powers to deny an application altogether, grant an application subject to standard conditions that address competitive concerns, or impose tailored conditions specific to a foreign-controlled entry or investment situation if anticompetitive harm is present.<sup>4</sup>

We support the Commission's commitment to Congress to perform such a case-by-case review. CCIA takes no position in support of or in opposition to the grant of the application in the instant proceeding. In so far as the transaction between DT and Voicestream will result in a fifth national carrier entering the U.S. market, it could lead to more competition, more innovation, more services, more opportunities for wireless vendors and lower costs to consumers. CCIA believes, nonetheless, that the Commission needs to employ the regulatory mechanisms outlined in current law that allow the Commission to refuse or condition approval of transactions involving foreign firms if anticompetitive harm is present.

CCIA has historically raised concerns about government-owned or sponsored entities that enter the competitive marketplace without the associated risk experienced by their private sector competitors. The issues raised in these comments concerning the DT/Voicestream proceeding coincide closely with CCIA's efforts to promote fair and open competition in our domestic markets. CCIA recently released a study that was undertaken by nationally acclaimed economists, including Dr. Joseph Stiglitz, which underscored the importance of differentiating between proper government action and improper government competition in the private sector.<sup>5</sup> The use of government power,

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<sup>2</sup> House Oversight Hearing on Foreign Government Ownership of American Telecommunications Companies, September 7, 2000.

<sup>3</sup> *Rules and Policies on Foreign Participation in the U.S. Telecommunications Market*, IB Docket No. 97-142, *Market Entry and Regulation of Foreign-Affiliated Entities*, IB Docket No. 95-22, Report and Order and Order on Reconsideration, 12 FCC Rcd 23891 (1997) ("Foreign Participation Order"), *recon. pending*.

<sup>4</sup> See House Oversight Hearing on Foreign Government Ownership of American Telecommunications Companies, September 7, 2000 (prepared statement of Chairman William E. Kennard).

<sup>5</sup> See JOSEPH E. STIGLITZ, ET. AL., *The Role of Government in a Digital Age*, at <http://www.cciagnet.org/digitalgovstudy/main.html> (last visited Nov. 7, 2000) (released in October, 2000,

either economic or regulatory, to improperly influence the marketplace when government is also a competitor is unacceptable whether it occurs domestically or internationally. To the extent that it is now occurring, it represents a dangerous trend.

The basis for this view can be simply stated: in a full and free competitive environment, no business should be subjected to the specter of competing with a concern that is buttressed with the "deep pockets" or the regulatory authority of a government that can promote or protect its parochial ownership interest without regard to ordinary market forces. Success or failure in business should be determined by the ability of a company to meet consumer demand in a competitive environment in which all parties are encountering the similar levels of risk, and an overall level playing field.

CCIA supports U.S. policies to promote open markets in both domestic and international telecommunications arenas. We advocate caution against government ownership of private companies both at home and abroad. In analyzing potential advantages or disadvantages posed by a foreign government intending to participate in the U.S. market, the Commission should work with the U.S. Trade Representative (USTR) to encourage divestiture and privatization plans customized for individual foreign-controlled companies.

It is a realistic expectation that foreign-controlled entities will be willing to make commitments in this direction. We have already seen both Nippon Telephone and Telegraph (NTT) and DT initiate such efforts. The successful negotiations between the U.S. and Japan in reducing the interconnection rates for U.S.-based companies demonstrate that the Japanese telecommunications market is becoming more competitive. Additionally, NTT is actively pursuing a change in its ownership structure. Currently, the Japanese government is in the process of selling off about one million shares of NTT a year in an effort to hold only one-third of NTT's shares, currently a statutory minimum. Following negotiations with the USTR, the German government has committed to taking steps to divest itself of any ownership interest in DT, although a specific timetable has not been agreed upon.

We believe that it is important that the U.S. and other countries in the WTO keep their commitments to deregulating the international telecommunications market. The Commission's authority to review mergers involving firms in WTO-member countries and to deny applications or set conditions should be used to remove barriers for companies trying to enter telecommunications markets that are not fully open. While the U.S. has opened its markets to foreign competition, some other members of the WTO still lag behind. CCIA recognizes problems too frequently experienced by U.S.-based companies entering and operating in foreign markets. These problems include pricing for

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this study was commissioned by CCIA as an independent analysis of the appropriate role for government in an information economy).

Ms. Magalie Roman Salas  
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interconnection, the lack or inability to obtain capacity for interconnection, assessment of regulatory fees and service quality. CCIA recommends that as the Commission reviews proposed transactions involving a foreign-government controlled entity for anticompetitive aspects and unfair government advantages, it should also consider how the foreign firm's country has done to promote international competition in a global telecommunications market.

In conclusion, CCIA supports the Commission's existing authority to review license transfers and other transactions involving U.S. companies and foreign-controlled entities in WTO-member countries. The Commission recently committed to using this authority to give close scrutiny to any merger involving foreign government-controlled firms before Congress. CCIA simply expects the Commission to keep this commitment by seriously considering the effects of foreign participation on the open and competitive U.S. telecommunications market, uninhibited by the specter of a self-protective government competitor, while continuing efforts to promote open competition on a global scale.

Sincerely,

A handwritten signature in black ink, appearing to read "Jason Mahler", with a long horizontal flourish extending to the right.

Jason Mahler  
Vice President and General Counsel

Enclosure

# **THE ROLE OF GOVERNMENT IN A DIGITAL AGE**

**JOSEPH E. STIGLITZ  
PETER R. ORSZAG  
JONATHAN M. ORSZAG**

**COMMISSIONED BY THE COMPUTER &  
COMMUNICATIONS INDUSTRY ASSOCIATION  
OCTOBER 2000**

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## Executive Summary

- Existing rules for evaluating governmental activities need to be updated to reflect the ongoing shift toward a digital economy. Industrial developments at the beginning of the 20<sup>th</sup> century required major rethinking of the role of government, as evidenced by the creation of the Federal Reserve System, the Sherman and Clayton Anti-Trust Acts, and the Constitutional amendment allowing a Federal income tax. A substantial review is also warranted now.
- As President Clinton has emphasized, for the government, “knowing when to act and – at least as important – when not to act, will be crucial to the development of electronic commerce.” The purpose of this study is to examine when the government should act and when it should not act in a digital economy. In particular, our focus is what services the government should and should not be providing on-line.
- As the report discusses, the theoretical underpinnings behind private versus public production shift as the economy moves toward a digital one. On one hand, the public good nature of production in a digital economy, along with the presence of network externalities, may suggest a larger public role than in a bricks-and-mortar economy. On the other hand, an information-based economy may also improve the quality and reduce the cost of obtaining information, which by itself makes private markets work better than before. Furthermore, government failure may be even more pronounced in the context of rapidly moving information-laden markets than in traditional bricks-and-mortar markets.
- The lack of clear theoretical guidance regarding the separation between government and business in a digital economy makes decision-making rules all the more important. OMB Circular A-76 and other existing norms for government provision of goods and services need to be updated for the digital age. We therefore devise a set of twelve principles for government action in a digital economy (see box below), along with a decision tree for policy-makers (see page 75) to use when evaluating new government activities. The principles are divided into three categories: “green light” activities that raise few concerns; “yellow light” activities that raise increasing levels of concern; and “red light” activities that raise significant concern.
- The report applies these principles to five case studies, including the Department of Labor’s on-line job market information system, the United States Postal Service eBillPay program, private-sector dissemination of legal information, on-line tax preparation software, and a fee-based search engine from the National Technical Information Service. In some cases (e.g., the America’s Job Bank), the government seems to have struck the appropriate balance among conflicting pressures. In other cases (e.g., eBillPay), the government seems to have overstepped the boundaries that should apply to public provision of goods and services.

## **Principles for On-Line and Informational Government Activity**

### ***"Green Light" for On-Line and Informational Government Activity***

Principle 1: Providing public data and information is a proper governmental role

Principle 2: Improving the efficiency with which governmental services are provided is a proper governmental role

Principle 3: The support of basic research is a proper governmental role

### ***"Yellow Light" for On-Line and Informational Government Activity***

Principle 4: The government should exercise caution in adding specialized value to public data and information

Principle 5: The government should only provide private goods, even if private-sector firms are not providing them, under limited circumstances

Principle 6: The government should only provide a service on-line if private provision with regulation or appropriate taxation would not be more efficient

Principle 7: The government should ensure that mechanisms exist to protect privacy, security, and consumer protection on-line

Principle 8: The government should promote network externalities only with great deliberation and care

Principle 9: The government should be allowed to maintain proprietary information or exercise rights under patents and/or copyrights only under special conditions (including national security)

### ***"Red Light" for On-Line and Informational Government Activity***

Principle 10: The government should exercise substantial caution in entering markets in which private-sector firms are active

Principle 11: The government (including government corporations) should generally not aim to maximize net revenues or take actions that would reduce competition

Principle 12: The government should only be allowed to provide goods or services for which appropriate privacy and conflict-of-interest protections have been erected

- The appropriate role of government in the economy is not a static concept: It must evolve as the economy and technology do. As economic activity shifts toward information-intensive goods and services, public policy is being presented with a series of challenges, from protecting privacy to the appropriate taxation of on-line sales and jurisdictional concerns.
- Policy-makers, analysts, and others may disagree with some of the principles and conclusions reached in this analysis. But it will have served its purpose if it helps to spur debate over these issues, regardless of whether all its conclusions are accepted.

# THE ROLE OF GOVERNMENT IN A DIGITAL AGE

Joseph E. Stiglitz, Peter R. Orszag, and Jonathan M. Orszag  
October 2000

## Introduction

Innovations in information technology (IT) have spurred significant changes in the U.S. economy over the past two decades. Firms have invested heavily in computers and peripheral equipment, along with software, advanced telecommunications systems, and other information technology. These investments have facilitated significant improvements in inventory systems, reduced shipping costs, and allowed more effective responses to changes in consumer preferences – thus improving the efficiency of the production system. At the same time, the American public is increasingly turning to computers and the Internet for a variety of purposes, from receiving an education to investing in the stock market or buying a car.

These developments are potentially momentous for the economy and for our broader society. As Alan Greenspan recently stated, “When historians look back at the latter half of the 1990s a decade or two hence, I suspect that they will conclude we are now living through a pivotal period in American economic history.”<sup>1</sup> To be sure, technological improvements have been ongoing over an extended period of time. The invention of electricity and the internal combustion engine

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<sup>1</sup> Alan Greenspan, “The revolution in information technology,” speech delivered to the Boston College Conference on the New Economy, March 6, 2000.

in the 1870s, for example, represented dramatic economic and social innovations.<sup>2</sup> But the changes engendered by advances in information technology also appear to represent a relatively rare historical development. Professor Paul David of Stanford University, for example, has compared the spread of the computer at the end of the 20<sup>th</sup> century to the spread of electricity at the end of the 19<sup>th</sup> century.<sup>3</sup>

The “pivotal period” that Alan Greenspan suspects we are currently experiencing has important implications not only for private-sector firms and American consumers, but also for the government. Just as the industrial developments at the end of the 19<sup>th</sup> century required major rethinking of the role of government – as evidenced by the creation of the Federal Reserve System (1913), the Sherman (1890) and Clayton (1914) Anti-Trust Acts, and the Constitutional amendment allowing a Federal income tax (1913) – a substantial review is warranted now.

Extant rules and norms for delineating what government should and should not do seem inadequate to the task, since they were not developed for the emerging electronic world. As Chairman Greenspan noted in a somewhat different context, today’s economy is “one that none of us has even seen before, and indeed it may be unprecedented in our history... The type of policy we have to devise has to reflect the nature of how the new economy is working. A

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<sup>2</sup> Some analysts argue that the inventions at the end of the 19<sup>th</sup> century were much more significant than the current information technology innovations. See, for example, Robert J. Gordon, “Does the ‘New Economy’ Measure up to the Great Innovations of the Past?” *Journal of Economic Perspectives*, forthcoming. We do not find it necessary to compare the significance of current innovations to those of the past, which is the focus of Gordon’s analysis; the key point for our purposes is that innovations in information technology raise new public policy concerns.

<sup>3</sup> See, for example, Paul David, “The Dynamo and the Computer: An Historical Perspective on the Modern Productivity Paradox,” *American Economic Review*, May 1990, pages 355-361, and “Computer and Dynamo: The Modern Productivity Paradox in a Not-Too-Distant Mirror,” Center for Economic Policy Research, Stanford University, Reprint Number 5, July 1995. Bob Davis and David Wessel of the *Wall Street Journal* extend the argument to include, for example, comparisons between the spread of high school education at the beginning of the

number of the old tools which we relied upon don't have relevance to this.”<sup>4</sup> As the *Wall Street Journal* recently added, “The country hasn’t been in such a state since the early part of last century, when a set of decisions shaped the relationship between the industrialized economy and the government for decades to come.”<sup>5</sup>

The questions facing policy-makers in considering what the government should and should not produce in a digital age are particularly difficult, since the line between internal efficiency improvements and the provision of goods and services to the public often becomes blurred. For example, if travel services are re-engineered and enhanced for government employees, why not increase economies of scale, and thereby reduce costs further for the government, by offering the same services to general citizens? Similarly, if government network infrastructure expands, and bulk communications service purchasing enables low prices, why not utilize unused capacity and serve as an Internet Service Provider (ISP) to the public, or resell communications services to the public?

In short, the spread of the Internet and other information technologies raises important new questions about the appropriate role for government in producing goods and services, and in regulating private-sector activities. As President Clinton emphasized in 1997, “Governments can have a profound effect on the growth of electronic commerce. By their actions, they can facilitate electronic trade or inhibit it. Knowing when to act and -- at least as important -- when

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20<sup>th</sup> century and the spread of college education at the beginning of the 21<sup>st</sup> century. See Bob Davis and David Wessel, *Prosperity: The Coming 20-Year Boom and What It Means to You* (Random House: New York, 1998).

<sup>4</sup> Testimony before the Senate Banking Committee, as quoted in Richard Stevenson, "Pondering Greenspan's Next Move," *The New York Times*, Tuesday, March 21, 2000, page C1.

<sup>5</sup> Bob Davis and Gerald Seib, "Policing a Wildfire: Technology Will Test a Washington Culture Born in Industrial Age," *Wall Street Journal*, May 1, 2000, page A1.

not to act, will be crucial to the development of electronic commerce.”<sup>6</sup>

The purpose of this study is to examine when the government should act and when it should not. In particular, our principal focus is what services the government should and should not be providing on-line. The study thus serves several purposes, including:

- Highlighting the need for re-thinking the role of government by policy-makers, the press, the business community, and academics;
- Providing policy-makers with a policy framework for evaluating whether new governmental activities would or would not be socially beneficial; and
- Using that framework to examine several recent case studies of existing or proposed public-sector activities.

The study is organized as follows: The first part provides important background to our exploration of the appropriate role for government in a digital economy. It examines the impact of information technology on the economy, business practices, and the government; the theory of the government’s role in the economy; and current government policy regarding commercial activities. The second part delineates 12 specific principles for governmental activities in a digital economy, including three “green light” principles regarding governmental activities that should elicit little concern, six “yellow light” principles regarding activities that should be undertaken only with significant caution, and three “red light” principles regarding activities that should generally not be undertaken by the government. The third part examines several case

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<sup>6</sup> Memorandum from President Clinton to the Heads of Executive Departments and Agencies, “Electronic Commerce,” July 1, 1997, available at <http://www.whitehouse.gov>.

studies against which these principles can be judged. A short final section offers conclusions and policy recommendations.

**PART I:  
INFORMATION  
TECHNOLOGY AND  
GOVERNMENT POLICY**

## **I. The Impact of Information Technology on the Economy, Business, and Government**

Information technology production and use are growing rapidly. By July 2000, for example, nearly 360 million people worldwide were connected to the Internet, up from 185 million people a year earlier.<sup>7</sup> In 1990, information technology industries (including hardware, software, and communications) accounted for 5.8 percent of U.S. gross domestic income.<sup>8</sup> By 1999, those industries accounted for an estimated 8.2 percent of gross domestic income. The purpose of this section is to explore how this rapid growth in information technology has affected the economy, businesses, and the government.

### *Impact of information technology on the economy*

In the long run, productivity growth is the key to improving living standards. The most important contribution that investments in information technology can make to economic performance is thus to improve productivity.

Throughout the 1980s and 1990s, firms made substantial investments in information technology. In 1996, for example, telecommunications firms invested an average of \$29,236 in information technology *per worker*. Non-depository financial institutions invested an average of \$18,129, and radio and television firms invested an average of \$17,512.<sup>9</sup>

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<sup>7</sup> Nua Internet Surveys, available at [http://www.nua.ie/surveys/how\\_many\\_online/world.html](http://www.nua.ie/surveys/how_many_online/world.html)

<sup>8</sup> U.S. Department of Commerce, *Statistical Abstract of the United States 1999*, Table 917, page 579.

<sup>9</sup> Council of Economic Advisers, *Economic Report of the President 2000* (Government Printing Office: Washington, 2000), Table 3-2.

Until the mid-1990s, however, the dramatic investments that firms were making in IT did not appear to translate into improvements in productivity. Indeed, Robert Solow, a Nobel-prize-winning economist at the Massachusetts Institute of Technology, famously quipped that, “We see computers everywhere but in the productivity statistics.”<sup>10</sup>

By the latter half of the 1990s, on the other hand, the massive IT investments *did* appear to be making a substantial contribution to improved economic performance. Productivity growth increased from an average of 1.6 percent per year between 1991 and 1995 to 2.7 percent per year between 1996 and 1999. As Chairman Greenspan noted, “until the mid-1990s, the billions of dollars that businesses had poured into information technology seemed to leave little imprint on the overall economy...The full value of computing power could be realized only after ways had been devised to link computers into large-scale networks. As we all know, that day has arrived.”<sup>11</sup>

One recent study concluded that investments in IT and efficiency improvements in the production of computers explain more than two-thirds of the increase in productivity growth between the early 1990s and the late 1990s.<sup>12</sup> In particular, productivity growth increased by 1.1 percentage points per year between 1991-1995 and 1996-1999 (from 1.6 percent per year to 2.7 percent per year). Of that 1.1 percentage point increase, 0.5 percentage points can be explained by investments in information technology and another 0.2 percentage points can be explained by

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<sup>10</sup> Robert M. Solow, “We’d Better Watch Out,” *New York Times Book Review*, July 12, 1987, page 36.

<sup>11</sup> Alan Greenspan, “The revolution in information technology,” speech delivered to the Boston College Conference on the New Economy, March 6, 2000.

<sup>12</sup> Stephen Oliner and Daniel Sichel, “The Resurgence of Growth in the Late 1990s: Is Information Technology the Story?” Federal Reserve Board of Governors, Finance and Economics Discussion Series, 2000-20, March 2000.

improved efficiency in computer and semi-conductor production. Thus, 0.7 percentage points of the 1.1 percentage point total increase was directly connected to information technologies.<sup>13</sup>

The disproportionate role played by information technology in bolstering aggregate productivity growth reflects, at least in part, phenomenal efficiency improvements within the sector itself. Between 1990 and 1997, for example, growth in output per worker in industries producing information technology goods and services averaged 10.4 percent, relative to 1.4 percent for the private non-farm economy as a whole.<sup>14</sup> One recent study documents productivity growth of 42 percent per year between 1995 and 1999 in the production of computers.<sup>15</sup>

The new information technologies may have induced not only higher productivity growth, but also more *stable* growth. For example, one of the key uses of information technologies has been in the area of logistics systems. A more efficient transportation system reduces the time required in sourcing, producing, and distributing goods, as well as the error rates in the supply chain.<sup>16</sup> It also reduces the inventories that firms must hold. The reduction in inventory holdings relative to sales over the past thirty years has been dramatic. The average lead-time for ordering materials and supplies in advance of production has declined from 72 days between January 1961 and

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<sup>13</sup> Stephen Oliner and Daniel Sichel, "The Resurgence of Growth in the Late 1990s: Is Information Technology the Story?" op. cit., Table 5.

<sup>14</sup> U.S. Department of Commerce, *The Emerging Digital Economy: II*, Table 3.2, available at <http://www.ecommerce.gov>.

<sup>15</sup> Robert Gordon, "Has the 'New Economy' Rendered the Productivity Slowdown Obsolete?" Northwestern University, June 14, 1999. It is worth noting, however, that Professor Gordon's paper suggests that there has been no cyclically-adjusted productivity growth increase in non-durable sectors that *use*, as opposed to produce, computers. Indeed, Gordon is skeptical of the "new economy" hypothesis precisely for this reason. As he argues, "Outside of durable manufacturing, the New Economy has been remarkably unfruitful as a creator of productivity growth." Gordon, "Does the 'New Economy' Measure up to the Great Inventions of the Past?" op. cit., page 46.

<sup>16</sup> U.S. Department of Transportation, *U.S. Freight: Economy in Motion 1998*, page 4.

December 1983 to less than 50 in 1997.<sup>17</sup> Total manufacturing and trade inventories have fallen from roughly 1.6 times monthly sales in the 1960s and 1970s to 1.3 times currently.<sup>18</sup>

These lower inventories have a variety of economic benefits, including:

- Reduced inventory carrying costs. The reduction in the inventory-sales ratio over the past three decades implies a substantial decline in the inventories firms must hold to meet current sales. Given recent levels of total manufacturing and trade sales, for example, inventories are roughly \$260 billion lower than they would have been without the improved inventory management.<sup>19</sup> The associated reduction in carrying costs allows more capital to flow into productive equipment and machinery.
- Reduced business cycle fluctuations. Historically, fluctuations in inventory investment have contributed significantly to business cycle fluctuations. One study concludes that more efficient inventory investment has played a critical role in reducing the variability of output growth over the past 15 years.<sup>20</sup> Alan Greenspan has added that "the dramatic changes in information technology that have enabled businesses to embrace the

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<sup>17</sup> National Association of Purchasing Managers, series on average lead time for ordering production materials.

<sup>18</sup> Council of Economic Advisers, *Economic Report of the President 2000* (Government Printing Office: Washington, 2000), Table B-55.

<sup>19</sup> In March 2000, for example, total manufacturing and trade inventories were \$1,166 billion. If the inventory-sales ratio were 1.6 (roughly its level at the end of the 1960s), total inventories would instead have been \$1,426 billion, or roughly \$260 billion higher than their current level.

<sup>20</sup> Margaret M. McConnell, Patricia C. Mosser, and Gabriel Perez Quiros, "A Decomposition of the Increased Stability of GDP Growth," Federal Reserve Bank of New York, *Current Issues in Economics and Finance*, September 1999.

techniques of just-in-time inventory management appear to have reduced that part of the business cycle that is attributable to inventory fluctuations...."<sup>21</sup>

In addition, investments in information technology may produce benefits that are not measured in the traditional statistics on productivity or GDP. For example, if new information technologies make it more convenient to purchase a book (e.g., by facilitating access to an impressive array of book titles on-line at any hour of the day), the added convenience to consumers of purchasing any given book is not directly captured in the productivity statistics. As Professor Alan Blinder of Princeton University recently wrote, "Retailing over the Internet may offer many benefits to consumers, such as easier comparison shopping, removal of travel costs, and 24-hour availability. But such gains will never be counted in GDP, and so will never appear in the productivity statistics."<sup>22</sup>

### *Impact of information technology on business*

The aggregate economic benefits of information technology – reflected in higher productivity growth and a reduction in the degree of economic fluctuation – arise from the improvements that such technology facilitates in the production of goods and services in sectors ranging from the media to banking, and from passenger travel to automobile manufacturing. This section briefly explores some of the ways in which information technology is changing the way businesses interact with consumers and the way businesses interact with other businesses.

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<sup>21</sup> Alan Greenspan, "New Challenges for Monetary Policy," Speech, Jackson Hole, Wyoming, August 27, 1999.

<sup>22</sup> Alan Blinder, "The Internet and the New Economy," Brookings Institution Policy Brief #60, June 2000, page 5.

## Business-to-consumer e-commerce

E-commerce is fundamentally changing the relationship between businesses and consumers, by increasing convenience and choice while saving time and money. Private-sector forecasts suggest that e-commerce will continue to grow rapidly; Internet retailing – which was estimated to be \$5.5 billion in the second quarter of 2000 – may rise to as high as \$80 billion by 2002.<sup>23</sup>

Four industries that are being dramatically altered by the e-commerce boom are:

- The Book Industry. One prominent example of a retail “e-business” is Amazon.com, which became the first Internet retailer in the on-line book selling market. The emergence of Amazon forced its “bricks and mortar” competitors (e.g., Barnes and Noble) to reconsider their own e-commerce strategies. As a virtual retailer, Amazon has no physical store infrastructure. According to the Department of Commerce, rent and depreciation represent less than 4 percent of Amazon’s sales, compared to 13 percent, on average, for traditional retailers.<sup>24</sup> Amazon also has lower labor costs and less capital tied up in inventory: book turnover averages 20-40 times per year relative to two to two-and-a-half times per year, on average, for traditional retailers.<sup>25</sup> As a result, Amazon is able to reduce the sales price of books. Indeed, a study by Professors Erik Brynjolfsson and Michael Smith of MIT found that prices for books and CDs on-line are 9 to 16 percent less expensive than in conventional outlets.<sup>26</sup> Lower prices, furthermore, have

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<sup>23</sup> Forrester Research, Inc. “Post-Web Retail--Market Overview,” September 1999, and Department of Commerce, Bureau of the Census, “Retail E-commerce Sales in Second Quarter 2000 Increased 5.3 Percent from First Quarter 2000, Census Bureau Reports,” August 31, 2000.

<sup>24</sup> U.S. Department of Commerce, *The Emerging Digital Economy*, Appendix 5, page 9, available at <http://www.ecommerce.gov>.

<sup>25</sup> Ibid.

<sup>26</sup> Erik Brynjolfsson and Michael Smith, “A Comparison of Internet and Conventional Retailers” *Management Science*, April 2000. However, another study found that 107 titles sold by 13 on-line and two physical bookstores had essentially the same cost. See Karen Clay, Ramayya Krishnan, Eric Wolff, and Danny Fernandes, “Retail

spurred a substantial increase in volume. In 1999, Amazon's revenue totalled \$1.6 billion, up 168 percent from 1998.<sup>27</sup> With 20 million customers in 160 countries, Amazon has clearly changed the dynamics of the book-selling industry.<sup>28</sup>

- Travel Planning Industry. From driving directions to hotel prices, the Internet has changed the way people obtain travel information. The largest on-line travel business is the sale of airline tickets. In 1996, consumers bought \$276 million worth of airline tickets on-line. In 1999, on-line travel sales reached an estimated \$9.4 billion – or 12.3 percent of the amount spent in the U.S. on air travel.<sup>29</sup> Forrester Research predicts that on-line travel purchases will quadruple, to \$40.7 billion, by 2003.<sup>30</sup> As in the book-selling example, on-line ticket processing offers cost savings. For example, according to the Air Transport Association of America, it costs an average of \$6 to \$8 to process an airline ticket booked by a travel agent, relative to just \$1 for a customer-booked “electronic ticket.” Airlines are also using the Web to implement more sophisticated pricing strategies. For instance, “e-fares” allow airlines to sell tickets to leisure travelers on flights that have a large number of open seats – thereby price discriminating among different types of customers to fill available capacity. As the Department of Commerce noted: “Every Monday or Tuesday, American Airlines looks at its yield management results and picks out low-performing markets. Midweek, more than one million ‘NetSAAver’ subscribers receive an e-mail from American Airlines listing special

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Strategies on the Web: Price and Non-price Competition in the On-line Book Industry,” Working Paper, December 1, 1999, available at <http://dnet.heinz.cmu.edu/dcsrg/books/papers/paper1.pdf>.

<sup>27</sup> Standard & Poor, Amazon.com Stock Report, April 22, 2000. Available at: <https://trading.etrade.com/cgi-bin/gx.cgi/applogic+ResearchStock>.

<sup>28</sup> See About Amazon.com at <http://www.amazon.com>

<sup>29</sup> E. Scott Reckard, “Threatened by the Web, Travel Agents Adopt New Tactics,” *Los Angeles Times*, April 30, 2000.

discounted fares for travel in selected markets during the upcoming weekend. The NetSAAver program has generated tens of millions of incremental dollars for the airline since its launch in March 1996.”<sup>31</sup> As a result of cost savings and revenue enhancements from the Internet, Merrill Lynch estimates that Delta Airlines will benefit by as much as \$500 million from e-commerce over the next five years.<sup>32</sup>

- The Expedited Freight Industry. One beneficiary of the growth in e-commerce has been the expedited freight industry. Indeed, *Forbes* recently stated that UPS was the “missing link in the burgeoning world of e-commerce.”<sup>33</sup> *Business Week* similarly described, “UPS delivery folks as the foot soldiers of the dot.com revolution.”<sup>34</sup> Transportation Secretary Rodney Slater has recognized the crucial role of express services in a digital world, arguing that “the time-definite, point-to-point delivery needs of e-commerce require an even more flexible and resilient transportation network...You can order 'Steaks from Omaha' on-line, but you can't download them to your plate. E-commerce delivery still requires transportation to move products from the warehouse to your house.”<sup>35</sup> Reflecting the core role of express services in the rapid growth of e-commerce, the number of packages per day shipped by on-line vendors is expected to rise from 650,000 in 1999 to 4,200,000 in 2003 – an annual growth rate of 59.4 percent.<sup>36</sup>

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<sup>30</sup> E. Scott Reckard, “Threatened by the Web, Travel Agents Adopt New Tactics,” op. cit. Jupiter Communications forecasts somewhat lower growth in on-line travel sales: they predict on-line travel purchases to reach \$28.2 billion in 2005.

<sup>31</sup> U.S. Department of Commerce, *The Emerging Digital Economy*, page 29, available at <http://www.ecommerce.gov>.

<sup>32</sup> Merrill Lynch, *e-Commerce: Virtually Here*, April 1999, page 43.

<sup>33</sup> *Forbes*, “Logistics in Brown,” January 10, 2000.

<sup>34</sup> *Business Week*, “Out of the Box at UPS,” January 10, 2000.

<sup>35</sup> Remarks of Secretary of Transportation Rodney Slater to the Executive Forum on “Delivering E-Commerce,” Atlanta, Georgia, February 11, 2000.

<sup>36</sup> Forrester Research, Inc., available at <http://www.forrester.com>

- The Media Industry. The Internet has made it possible for consumers to receive news from around the world. Today, there are approximately 4,500 newspapers available on-line, with approximately 65 percent based in the United States.<sup>37</sup> There are hundreds, and perhaps thousands, of television stations with Web sites. One recent survey found that nearly 90 percent of Web users go on-line to get news and information.<sup>38</sup> As a result of this “new media,” the old media – such as broadcast television stations and traditional newspapers and magazines – have changed their business models. For example, America On-Line (a new media firm) recently proposed purchasing Time-Warner (an old media conglomerate). One of Time-Warner’s motivations for agreeing to the acquisition was the need to adapt to the new economy. Time-Warner understood that the Internet allows consumers the ability to get highly specialized information (e.g., *Agricultural and Resource Economics Review*) and more general media (e.g., the *New York Times* and the *Washington Post*). Furthermore, the World Wide Web also allows consumers to receive more information than is often available in the print version. For example, *Business Week* provides access to archives of its magazine and special reports not available in the print version. And unlike print versions, digitally stored material can be used repeatedly since there is little or no extra cost for the marginal viewer.

### Business-to-business e-commerce

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<sup>37</sup> See <http://emedia1.mediainfo.com/emedia/> for list of newspapers available on-line, along with their locations.

<sup>38</sup> U.S. Department of Commerce, *The Emerging Digital Economy*, op. cit., page 24.

While e-commerce is changing the business-to-consumer relationship, it is also profoundly changing the business-to-business relationship. A recent forecast by Forrester Research found that “more than 90% of firms described plans to buy and sell on the Internet.”

In February 2000, Forrester predicted that U.S. business-to-business e-commerce would reach \$2.7 trillion in 2004.<sup>39</sup> Estimates of business-to-business e-commerce growth, however, are highly uncertain, and other studies forecast even faster growth. For example, Boston Consulting Group has forecasted that business-to-business e-commerce would be \$4.8 trillion in 2004, while the Gartner Group has predicted growth to \$7.3 trillion and Bank of America has predicted it would reach \$13 trillion in that year.<sup>40</sup>

This growth in business-to-business e-commerce will increase the efficiency of American businesses. As the Second Annual Report of the President’s Electronic Commerce Working Group report stated, “electronic commerce means reduced inventory loads, lower cycle times, more efficient and effective customer service, lower sales and marketing costs, and new sales opportunities.” In addition, one recent study found that U.S. companies using Internet technologies to improve core business processes will save over \$600 billion on an annual basis by 2002.<sup>41</sup> And American Express claims that its purchasing card, when combined with an on-line purchasing system, can streamline processes and create savings of up to 95 percent.<sup>42</sup>

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<sup>39</sup> Forrester Research, Inc., “eMarketplaces Will Lead US Business eCommerce To \$2.7 Trillion In 2004, According to Forrester,” February 7, 2000, available at <http://www.forrester.com>.

<sup>40</sup> Boston Consulting Group, available at [http://www.bcg.com/media\\_center/media\\_press\\_release\\_subpage22.asp](http://www.bcg.com/media_center/media_press_release_subpage22.asp), September 11, 2000; Gartner Group, January 26, 2000; and *Fortune*, May 15, 2000.

<sup>41</sup> “Global Annual Cost Savings From Electronic Commerce Will Reach \$1.25 Trillion by 2002,” August 5, 1999, available at <http://www.gigaweb.com>.

<sup>42</sup> Available at [http://home3.americanexpress.com/corporateservices/purchasing\\_center/leverage\\_ecommerce.html](http://home3.americanexpress.com/corporateservices/purchasing_center/leverage_ecommerce.html).

Three examples of how business-to-business e-commerce is fundamentally changing the business practices include:

- The Automobile Industry. Last year, both Ford and GM announced plans to develop an automotive e-business supply chain to streamline purchasing transactions with more than 30,000 suppliers. Ford stated that this new electronic marketplace will “dramatically reduce” purchasing costs and make its production process more efficient through an integrated supply chain system.<sup>43</sup> Similarly, GM stated that its effort would create “the world’s largest ‘virtual marketplace’ for a wide array of products, raw materials, parts, and services.”<sup>44</sup> In February 2000, Ford, GM, and DaimlerChrysler announced that they were combining their efforts to form a single on-line business-to-business supplier exchange. As Jacques Nasser, the President and CEO of Ford, stated, this on-line business-to-business exchange “is another example of how the Internet is transforming every piece of our company and our industry.”<sup>45</sup> The on-line exchange will ultimately handle \$250 billion in direct purchases by these automobile manufacturers, which should reduce inventory costs and raise productivity. While it would initially bring together suppliers, partners, and dealers with manufacturers, Ford, GM, and DaimlerChrysler hope to expand the on-line exchange to encompass other industries.

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<sup>43</sup> “Ford and Oracle To Create Multi-Billion-Dollar Business-to-Business Internet Venture,” Ford Motor Company Press Release, November 2, 1999, available at <http://www.ford.com>.

<sup>44</sup> “General Motors Joins Forces With Commerce One to Move into Business-to-Business E-Commerce with Innovative Internet Purchasing Enterprise,” General Motors Press Release, November 2, 1999, available at <http://www.gm.com>.

<sup>45</sup> “Ford, GM, and DaimlerChrysler Create World’s Largest Internet-Based Virtual Marketplace,” Ford Motor Company Press Release, February 25, 2000, available at <http://www.ford.com>.

- The Steel Industry. The steel industry is perhaps the paragon of the “old economy.” But, recently, the steel industry has begun to utilize on-line business-to-business exchanges, such as MetalSite and e-steel.com. Today, approximately \$500 million of steel is sold on MetalSite each year. However, only a small proportion of steel producers currently take advantage of the Internet. A recent Andersen Consulting survey found that while 91 percent of steel companies knew about the Internet-based business-to-business portals, less than one-quarter were using them.<sup>46</sup> As a result, there is significant room for growth. One estimate suggests that steel e-commerce transactions could reach \$44 billion in 2004 and \$200 billion by 2010. Morgan Stanley Dean Witter predicts that on-line transactions will involve 5 to 6 million tons of steel this year and double that in 2001.<sup>47</sup> As Richard Riederer, the President and Chief Executive Officer of Weirton Steel, said, “Metal Site is revolutionizing the way metal is bought and sold, making the process more efficient and effective. This is just the beginning of a truly independent global marketplace.”<sup>48</sup>
- The Data Networking Industry. Cisco Systems dominates the data networking industry that provides the basic underpinnings of the Internet, including items such as switches, routers, and network hubs. Cisco controls nearly half of the \$36 billion data-networking industry.<sup>49</sup> With traffic on the Internet doubling every 100 days, Cisco has grown rapidly. In 1999, for example, Cisco’s revenues increased from \$8.5 billion to \$12.2 billion, a 44-percent increase. Cisco uses the Internet to improve its own internal operations: 90 percent of its internal communications are done on Internet-based

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<sup>46</sup> Nikki Tait, “Steel sector slow to embrace e-commerce,” *Financial Times*, March 27, 2000.

<sup>47</sup> Scott Robertson, “Analysts size up impact of e-commerce on steel,” *American Metal Market*, March 30, 2000.

<sup>48</sup> Steve Boni, “Steel Producer Cashes in On E-commerce Web Site,” *Newsbytes*, December 30, 1999.

systems;<sup>50</sup> nearly 80 percent of its orders are completed on-line;<sup>51</sup> and the vast majority (80 percent) of its customer-service issues are handled over the Internet, which saves Cisco an estimated \$125 million per year.<sup>52</sup> Cisco uses the Internet to recruit and screen job candidates, saving them millions of dollars in human resource costs. The company will also have the ability within a year to be the first company capable of “virtually” closing its books on any given day. Finally, Cisco Systems uses the Internet to streamline its production process; about half of its on-line orders are directed to the outside company that actually makes the product and ships it to the customer. As *Business Week* wrote: “For these orders, no Cisco employee ever touches a piece of paper until a check arrives in the mail to pay for the goods. Soon, with e-payment, even the check could be a thing of the past.”<sup>53</sup> Cisco estimates that using the Internet to conduct its business operations (from technical support to marketing materials) has saved \$363 million per year – or approximately 17.5 percent of total operating costs.<sup>54</sup>

- The Aircraft Maintenance Industry. In November 1996, Boeing launched its Part Analysis and Requirements Tracking (PARTS) business-to-business web site, which provides its customers with a one-stop shop for on-line ordering and maintenance information. The PARTS web site provides airlines and maintenance firms with a direct

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<sup>49</sup> Jason Krause, “The Evangelist: John Chambers, the Most Important Infrastructure Builder,” *The Industry Standard*, May 1, 2000, page 250.

<sup>50</sup> Ibid.

<sup>51</sup> *Towards Digital eQuality*, U.S. Government Working Group on Electronic Commerce, 2nd Annual Report (1999), available at <http://www.ecommerce.gov>.

<sup>52</sup> U.S. Department of Commerce, *The Emerging Digital Economy*, Appendix 3, page 13, and *Towards Digital eQuality*, U.S. Government Working Group on Electronic Commerce, 2nd Annual Report (1999), both of which are available at <http://www.ecommerce.gov>.

<sup>53</sup> Andy Reinhardt, “The Man Who Hones Cisco’s Cutting Edge,” *Business Week*, September 13, 1999.

<sup>54</sup> U.S. Department of Commerce, *The Emerging Digital Economy*, Appendix 3, page 13, available at <http://www.ecommerce.gov>.

link to half a million different types of spare parts stored in seven distribution centers worldwide. With 11,000 Boeing and McDonnell Douglas jetliners in service around the world today, the volume of transactions on PARTS has grown 100 percent *each year* since 1996.<sup>55</sup> As a result, nearly 85 percent of all spare parts ordered from Boeing are now ordered electronically. The web site processes about 18,000 transactions on an average day (this includes orders as well as inquiries about shipping status, inventory levels, and pricing).<sup>56</sup> While the primary intent of PARTS was to improve customer service, it is also helping to reduce operating costs and administrative errors as more and more customers communicate using the Internet. For example, in 1997, Boeing processed 20 percent more shipments per month than it did in 1996 with the same number of data-entry workers.<sup>57</sup> Boeing has also used the Internet to provide airline mechanics with technical drawings and support. According to one estimate, providing technical drawings electronically will save a mid-sized airline approximately \$5 million per year.<sup>58</sup>

### *Impact of information technology on government*

Just as information technology has transformed the economy and businesses, it is altering how government operates and how it provides services to the public. The Internet allows the government to disseminate a wealth of information about its goods and services directly to the public – from the most recent economics statistic release at the Bureau of the Census to the

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<sup>55</sup> “Boeing Spare Parts Web Site: E-Commerce Success Story,” November 23, 1999. Available at: [http://www.boeing.com/news/releases/1999/news\\_releases\\_991123a.html](http://www.boeing.com/news/releases/1999/news_releases_991123a.html).

<sup>56</sup> Ibid.

<sup>57</sup> U.S. Department of Commerce, *The Emerging Digital Economy*, op. cit., Appendix 3, page 17.

<sup>58</sup> Ibid, page 20.

## **About This Study**

This study was commissioned by the Computer & Communications Industry Association (CCIA) as an independent analysis of the appropriate role for government in an information economy. The views and opinions expressed in this study are solely those of the authors and do not necessarily reflect the views and opinions of CCIA.

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