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**ELECTRONIC COMMERCE AND
PRODUCTIVITY GROWTH:
DEFINING AND ASSESSING
THE LINKAGES**

*Occasional Paper Number 28
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Industry Canada Research Publications Program

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1. INTRODUCTION

“In general, it is thought that electronic commerce can significantly improve the efficiency of economies, enhance their competitiveness, improve the allocation of resources and increase long-term growth.”
(OECD, 2000, p. 55)

While there is substantial disagreement about how quickly and dramatically electronic commerce (henceforth, e-commerce) will affect real income levels, there is little doubt that the emergence and growth of e-commerce promises to have substantial beneficial effects on worldwide standards of living. Since e-commerce is still in its very early stages of adoption, it is arguably foolhardy to attempt to predict the impacts it will ultimately have on real income levels, let alone the timing of these impacts. Nevertheless, policymakers must come to grips with issues such as whether and how the adoption path of e-commerce should be stimulated by government policies. As well, forecasts of future real economic growth rates may need to be modified in light of the e-commerce phenomenon, especially if e-commerce results in major improvements in economic efficiency as some experts predict.

Notwithstanding the enormous literature on e-commerce that has accumulated in both academic and trade journals, to our knowledge no systematic attempts have been made to classify and assess, even on a very preliminary basis, the linkages between e-commerce and productivity levels and growth rates. Since productivity growth is ultimately the source of higher real standards of living in society, the linkages between e-commerce and productivity should be of particular interest to policymakers. In particular, a comprehensive identification of these potential linkages could help policymakers better formulate and implement policies that might leverage larger productivity benefits from private sector investments in e-commerce activities.

Hence, the broad purpose of this study is to identify and evaluate the potential linkages between e-commerce and the productivity performance of the Canadian economy. A related purpose is to identify important public policy issues conditioning the linkages identified, and, as a related consequence, identify topics for future research consideration.

The study consists of the following sections. In the section entitled “Defining the Concepts,” we set out some definitions of e-commerce and productivity, as well as some historical data on the two phenomena, by way of background. The section entitled “Linking E-Commerce to Productivity

Growth” describes a conceptual framework within which the major linkages between e-commerce and productivity performance might be identified and evaluated. The section entitled “Assessing the Linkages” discusses some preliminary evidence bearing upon the nature and magnitude of the linkages identified in the preceding section. The last section, entitled “Policy Issues,” identifies and briefly discusses several prominent policy issues.

2. DEFINING THE CONCEPTS

In this section, definitions of e-commerce and productivity performance are provided. While precise definitions are not of particular importance, explicit definitions of the phenomena are useful in order to avoid unintended confusion. As well, available data are easier to interpret and evaluate if the reader understands the activities and economic outcomes to which they apply.

Definition of Electronic Commerce

“There is no universal definition of electronic commerce because the Internet marketplace and its participants are so numerous and their intricate relationships are evolving so rapidly.”
(NOIE, 1999, p. 2)

The term *e-commerce* describes many uses of modern telecommunications and information technology. For example, an encompassing definition would include any form of business activity conducted on the electronic medium (Wigand, 1997).¹ This would include electronic data interchange (EDI), electronic mail and related types of communication. In fact, while EDI has been equated with e-commerce in the past, it is more appropriately viewed now as a subset of e-commerce. In the vernacular, EDI encompasses business-to-business (B-to-B) electronic transactions. Commercial transactions involving sales to households are identified as business-to-consumer (B-to-C) electronic transactions.

Non-commercial transactions conducted electronically do not qualify as e-commerce by most definitions, although, as a practical matter, the boundary between commercial and non-commercial transacting is somewhat vague. For purposes of this report, commercial transactions must be carried-out over the Internet/World Wide Web (henceforth, Internet) to be characterized as a part of e-commerce. While many commercial transactions are carried out on private electronic networks, the main hypotheses linking e-commerce to economic growth focus on public-access networks, of which the Internet is the dominant model.

Table 1
Consultants' Estimates of Worldwide E-Commerce
(billion \$US)

Consultants	1999	2003	Average Annual Growth
E-Markets	98.4	1,224	89
IDC	111.4	1,317	85
Active Media	95.0	1,324	93
Forrester (low)*	70.0	1,800	125
Forrester (high)*	170.0	3,200	108
Boston Consulting Group	1,000.0	4,600	46

* Includes Internet-based EDI.

Source: Coppel (2000, p. 7).

The Magnitude and Nature of Electronic Commerce

Systematically collected data on the magnitude and nature of e-commerce transactions are generally unavailable. One set of estimates of global e-commerce activity is provided in Table 1. The wide range of estimates reported for 1999 underscores the tentative nature of the available evidence. More certain is the fact that B-to-B transactions comprise the largest share of e-commerce — indeed, as much as 70 percent to 80 percent of total e-commerce (Coppel, 2000).

Most observations and estimates available on the use of the Internet for commercial purposes apply primarily to the United States. Such data further highlight the embryonic nature of e-commerce. For example, it is estimated that, in the first quarter of 2000, online retail sales in the United States totalled US\$5.26 billion. This represented just 0.7 percent of the total economy's US\$747.8 billion in retail sales. While formal estimates of B-to-B e-commerce are unavailable, such sales are thought to be less than 1 percent of commercial transactions (Blackman, 2000).² An obvious inference that one might draw from these observations is that, at current utilization rates, e-commerce is a relatively modest economic phenomenon, and substantial productivity effects are unlikely in the absence of significant continued growth in its adoption.³

To be sure, the consensus expectation is that e-commerce will continue to grow rapidly, both in absolute terms and in relation to overall economic activity. For example, one (perhaps extreme) forecast projects that

B-to-C commerce will grow to US\$108 billion by the end of 2003.⁴ Rapid growth is also projected for B-to-B e-commerce. According to one estimate, that form of e-commerce will more than triple in volume by 2003 compared to its 1999 level (Hof, 1999).

It is less clear that the scope of e-commerce, especially the B-to-C variety, will expand over time. In this regard, data reported in Table 2 highlight the relatively narrow product scope of B-to-C e-commerce to date. In particular, online computer hardware and software sales have constituted a disproportionately large share of household products purchased on the Internet. Online purchasing in the areas of travel, entertainment, books and music has also been relatively robust.

There is some evidence of a recent broadening of product categories for B-to-C commerce. For example, there has been a relative increase in the magnitude of sales in previously laggard categories such as clothing, furniture and groceries (see Table 3). This development is apparently due, in part, to more women shopping online.⁵ Nevertheless, computers and software, books and music, and travel remain the dominant product categories for Internet retail activity.⁶ Clearly, a broadening of the commercial transactions carried out on the Internet must occur if e-commerce is to have substantial economy-wide productivity consequences.

Table 2
Estimates of Internet Shopping
(millions of dollars)

	1997	2000
PC Hardware and Software	863	2,901
Travel	654	4,741
Entertainment	298	1,921
Books and Music	156	761
Gifts, Flowers and Greetings	149	591
Apparel and Fashion	92	361
Food and Beverages	90	354
Jewelry	38	107
Sporting Goods	20	63
Consumer Electronics	19	93
Other	65	197
TOTAL	2,444	12,090

Source: "The Virtual Mall Gets Real," *Business Week*, January 26, 1998, pp. 90–1.

Table 3
Percent of All Online Stores
Opened for Less than the Number of Years Specified

	1 Year	2 Years	3 Years
Gifts, Jewelry, Flowers and Greetings	17.3	3.2	11.9
Hobbies, Crafts and Antiques	16.5	12.8	12.6
Medical, Legal and Other Services	12.2	5.6	6.0
Apparel and Accessories	11.5	5.6	11.9
Computer Products and Software	11.5	13.6	15.9
CDs, Tapes and Books	9.4	15.2	17.9
Toys and Games	6.5	1.6	4.0
Art	2.9	1.6	1.3
Banking, Finance and Investment	2.9	1.6	6.6

Source: "A Hard Sell Online? Guess Again," *Business Week*, July 12, 1999, p. 143.

Productivity

Productivity performance is usually identified by two concepts: productivity level and productivity growth. The productivity level is related to the standard of living in a country, while productivity growth is the major determinant of the rate of increase in living standards over time. In fact, for Canada, the two performance measures have been strongly related over the past four decades (Harris, 1999). Hence, it does not seem necessary to distinguish between the potential linkages between e-commerce and productivity levels, on the one hand, and e-commerce and productivity growth rates, on the other. For convenience, the focus of this report will be on the potential linkages between e-commerce and changes in productivity levels (i.e. productivity growth) over time.

The most meaningful measure of how efficiently a society is utilizing its productive resources is multi-factor productivity. Multi-factor productivity growth equals the growth rate of real output less a weighted sum of the growth rates of capital and labour inputs, where the weight of each factor corresponds to its share of the cost of producing the output. The aggregate rate of productivity growth will, therefore, reflect productivity growth rates of individual microeconomic units, as well as the reallocation of resources across microeconomic units enjoying different productivity performances. The latter is ordinarily related to changes in allocative efficiency, whereas the former is ordinarily related to changes in technical efficiency.

Allocative, Technical and Dynamic Efficiency

While it is difficult, as a practical matter, to distinguish precisely among the various sources of productivity improvement, conceptual distinctions can be made, and such distinctions are helpful.

Allocative Efficiency

A market is allocatively efficient if it is not possible to increase the value of real output by reallocating production from one producing unit to another, or by reallocating final output from one consumer to another. Under a set of conditions that define a perfectly competitive market, allocative efficiency will be maximized. At least two conditions are worth highlighting, as many observers argue that the emergence and growth of e-commerce will affect them. The first is the degree to which information about prices and other elements of potential transactions is available to market participants. To the extent that such information is costly or otherwise difficult for market participants to obtain, significant departures from allocative efficiency are more likely. The second is the extent of competition or contestability. The more imperfect the competitive process, the larger the likely gap between actual and potential allocative efficiency.⁷ Conversely, reductions in information costs and increases in competitive pressures are likely to improve allocative efficiency.

There is a growing body of evidence that the productivity growth process is fundamentally driven by the reallocation of resources from low-productivity growth activities to high-productivity growth activities. In particular, productivity growth is observed as more-productive plants expand and less-productive plants contract (Harris, 1999). The impact of public policies on productivity growth will therefore depend in part on the way they influence the reallocation of resources among producing units. Likewise, a potentially important linkage between e-commerce and productivity growth is through the former's impact on the reallocation of resources from less-productive to more-productive users of inputs.

Technical Efficiency

Production units are technically efficient if they cannot produce their current level of output with fewer inputs, given existing knowledge about technology and the organization of production. Equivalently, a firm is producing efficiently if, given the quantity of inputs used, no more output could be produced based

on existing knowledge (Perloff, 1999, p. 162). Conceptually, a similar interpretation can be applied to consumers. That is, individual consumers are technically efficient if they cannot achieve higher levels of utility without spending more money on goods and services.

In broad terms, a producer will be technically efficient if inputs are obtained at the lowest possible cost, and if they are used in combinations that maximize real output. Once again, improved information, in this case about the availability of cheaper inputs, or cheaper input combinations, could be an important source of improved efficiency. Similarly, a consumer will be technically efficient if final outputs are obtained at the lowest possible cost. So, improved information about the prices and other attributes of final goods and services could improve productivity. On the other hand, the linkage between competition and technical efficiency is less certain. While market power allows a firm to be technically inefficient, without necessarily being driven from the market, owners of firms would presumably want to maximize technical efficiency, since it is consistent with maximizing profitability. To be sure, a variety of so-called principal-agent problems might lead to non-profit-maximizing behaviour on the part of producers. In the event, the existence of market power enables producers to survive while failing to maximize profits. Therefore, as a practical matter, it is likely that increased competition will be associated with improved technical efficiency.

Dynamic Efficiency

In its broadest sense, dynamic efficiency encompasses changes in knowledge about technology and the organization of production such that producers are able to increase real output without commensurate increases in real inputs.⁸ To the extent that resulting cost savings, or quality improvements, are passed through to final consumers, improved dynamic efficiency makes it possible for final consumers to realize higher standards of living at the same nominal income levels. Alternatively, to the extent that dynamic efficiency gains are passed backward to factors of production, final consumers will enjoy improved nominal incomes that will enable them to purchase more goods and services at existing prices.

Dynamic efficiency is often equated with technological change or innovation. In theory, changes in the organization of production may occur without technological change. For example, the scale and scope of a firm's production might change without the incorporation of new capital equipment or

other alterations of the underlying techniques for producing and distributing output. In turn, changes in scale and scope might improve efficiency over time. As another example, by providing workers with training and further education, firms may be able to increase the value of output above the cost of the training and education provided.

As a practical matter, operating at a different scale or scope, or utilizing more highly trained workers, will usually require firms to adopt new or improved physical inputs and/or organizational techniques. That is, the broad concept of dynamic efficiency will largely overlap the theoretically more circumscribed concept of technological change. Again, for purposes of this paper, precise terminological distinctions are unnecessary. Observers highlight the organizational changes in production and distribution that are facilitated by e-commerce. Equivalently, observers highlight the linkage between e-commerce and technological change, and that is the linkage this report focuses on.

The potential linkages between e-commerce and dynamic efficiency are, at the same time, more diffuse and indirect than are the linkages between e-commerce and other components of efficiency. Perhaps the most important potential direct impact of e-commerce on dynamic efficiency is the capability that e-commerce provides both firms and households to reorganize the ways in which they carry out their economic activities.⁹ While there are innumerable possibilities in this regard, an example often cited is the enhanced ability of producers to contract out the production of inputs that were formerly produced in-house. With improved control over the contracting-out process, cost savings and improved quality of inputs might be realized by producing units over time. Households can also use the Internet to contract-in services that might be difficult or excessively expensive to acquire through more conventional channels. An example is education. The proliferation of higher educational programs on the Internet offers a new way for individuals to invest in human capital. As a result, one might expect greater investment in human capital over time, with resulting long-run improvements in productivity.

Another (related) example is the elimination of many forms of (transactional) intermediation made possible by e-commerce. In this context, information (broadly defined) is exchanged directly between the supplier and the customer without the need for intervention by specialist intermediaries. In effect, transactional activities such as order taking and sales confirmation are reorganized so as to reduce or eliminate the utilization of more

conventional inputs. Observers often highlight the example of the brokerage industry, where online trading companies carry out retail stock market transactions largely without the services of traditional customer representatives.

In many cases, reductions in transaction costs underlie the potential linkage between electronic commerce and dynamic efficiency. For example, by facilitating easier and cheaper identification of possible sub-contractors, search costs are mitigated as a barrier to contracting-out. It is also easier to alter the specifications surrounding transactions thereby reducing delays in communication. Hence, the costs of contracting-out should also decline. More generally, reductions in transaction costs, especially costs associated with identifying, monitoring and enforcing agreements associated with reorganized modes of commercial activity, should facilitate a wide range of new forms of transacting. Beyond contracting-out, they might include increased use of joint ventures and other collaborative arrangements, on both a short-term and long-term basis, as well as more frequent use of consortia to carry out research and development and other activities contributing to technological change.

The impact on dynamic efficiency of changes in underlying competitive conditions is potentially quite complex. For one thing, the relationship between market structure and technological change is uncertain. Specifically, it has been found that a substantial degree of market power is associated with innovation in some industries, while the opposite is true for other industries (Kamien and Schwartz, 1982). Nevertheless, a generalization along the following lines does not seem inappropriate: the threat of entry is a salutary incentive for firms to engage in innovation, especially in technology-intensive industries (*ibid.*). Hence, to the extent that the emergence and growth of e-commerce promotes increased contestability of markets, technological change might also be indirectly stimulated.

Costs of Adoption

Up to this point, the discussion has identified the potential productivity benefits associated with e-commerce. It is also important to acknowledge that there will be costs associated with the adoption of e-commerce technology and related commercial practices. Those costs reflect, in part, the real resources expended in order to develop the private and public sector institutions necessary for the effective functioning of e-commerce. An example is the development of an

appropriate intellectual property infrastructure to address the unique challenges to private property rights posed by the Internet. Other examples include investments in hardware and software information technology, especially broadband transmission capacity, the development of secure electronic payment systems, including electronic money, the advertising and promotion necessary to inform consumers about the availability of e-commerce opportunities and offerings, and the implementation of tax treaties and protocols to address public policy issues arising from the growth of cross-border commerce.¹⁰

The costs of adopting e-commerce can be likened to the costs of increased environmental protection. Specifically, even an optimal environmental protection regime will impose costs on the economy, as investments in physical and human capital, as well as variable costs associated with altering production techniques, are required to meet new environmental standards. While the adoption of new environmental standards might well have net benefits for society, the relevant costs are likely to be incurred before most of the relevant benefits are enjoyed. Hence, one must also be concerned about the timing, as well as the magnitude of the relevant benefit and cost streams, in order to estimate the net present value of the standards in question. Similar timing considerations are likely to apply to e-commerce as well.

Summary

“The ease of shopping nationally — or even globally — online frees consumers from dependence on local merchants. Low-cost outlets win additional business and thrive. High-cost sellers shrink and eventually go out of business. At the same time, electronic commerce reduces or even eliminates layers of retail and wholesale, cutting the cost of marketing and distribution.”

(Federal Reserve Bank of Dallas, 1999, p. 16)

The preceding section provides a broad conceptual framework linking e-commerce to productivity change. The main linkages arguably occur through two channels: 1) reduced transaction costs; and 2) increased competition and contestability. While it might seem excessively reductionist to equate the many potential consequences of e-commerce to these two broad channels, the essential nature of the underlying technology is supportive of this conceptual classification. Specifically, at its core, the Internet is a communications medium. As such, its major impact should be associated with

changes in the cost structure of communications. Certainly, reductions in transaction costs are an important expected outcome of reductions in communications costs.¹¹ Reduced communications costs might also be expected to expand the relevant geographic market of many products, thereby promoting more structurally competitive markets. As a related matter, the substitution of relatively inexpensive communication inputs for relatively expensive physical (e.g. “bricks and mortar”), and non-physical inputs (e.g. stockbrokers) should lower the costs of entry into the relevant markets, especially those characterized by high fixed and sunk costs.

The linkages between e-commerce, on the one hand, and transaction costs, competition and contestability, on the other, are explored in more detail in the next section.

3. LINKING E-COMMERCE TO PRODUCTIVITY GROWTH

“With the Internet’s arrival, many transaction costs are approaching zero. Large and diverse sets of people scattered around the world can now, cheaply and easily, gain near real-time access to the information they need to make smart decisions and coordinate complex activities.” (Tapscott, 2000, p. A38)

As discussed above, there appear to be two main interrelated drivers linking e-commerce and productivity growth. One is the reduction in a range of transaction costs that directly or indirectly promotes increased allocative, technical and dynamic efficiency. The other is increased competition and contestability that leads to improvements in allocative and technical efficiency, and likely in dynamic efficiency as well.

Transaction Costs

In order to better assess the potential impact of e-commerce on transaction costs, it is useful to outline the nature of those costs. The costs of transacting are essentially comprised of:

1. *Search costs*: the costs of physically searching for market information related to potential buyers, sellers, product availability, product quality, prices and so forth.
2. *Contracting costs*: the costs of creating and implementing contractual agreements.
3. *Monitoring costs*: the costs of ensuring that contractual commitments are satisfied.
4. *Adaptation costs*: the costs associated with negotiating and implementing changes to contracts over time.¹²

Search Costs

Most discussions of the economic advantages of e-commerce focus on the reductions in search costs resulting from the increased ease with which information about prices, product availability, demand and so forth can be obtained using the Internet. These reductions in search costs would be especially relevant for specialized products for which market participants are few in number and perhaps widely dispersed geographically.¹³ As a result, markets for products whose search costs are significantly reduced by e-commerce should become more competitive, since a greater number of market participants, hitherto segmented by geographical space, will compete for favourable terms and conditions. Consequently, product prices should more

closely approximate their marginal costs, thereby contributing to improved allocative efficiency.¹⁴ Technical efficiency should also improve as producers in hitherto segmented markets face new competition from outside. Both technical and dynamic efficiency should improve as producers and consumers become better informed about factor input prices and, more generally, about ways to produce and consume more efficiently.

Search goods

Economists identify a product as a search good if the important attributes of the product can be identified by the consumer prior to purchase. Computer equipment is an obvious example of a search good, as technical specifications are quite meaningful and are easily communicated to potential buyers. Financial securities listed on major stock exchanges are also search goods in that properties such as price, volume, dividend yield and so forth can be readily and easily determined prior to purchase.

Experience and Credence Goods

If the consumer must utilize a product in order to determine key attributes (such as ease of use, durability, etc.), the product is said to have *experience* qualities.¹⁵ An example of an experience good is the automobile. Certain subjective characteristics of an automobile, such as road feel, steering responsiveness and so forth can usually best be established by driving the car.

Critical attributes of some specialized products may not be identifiable with confidence even after utilization. Economists identify such products as *credence* goods. An example sometimes cited is medical services. Since patients will frequently improve independently of the services provided by health care professionals, only fairly prolonged experience with the ministrations of a health care specialist will provide the patient with insight into whether or not the specialist adds significant value to the patient's efforts to be healthy. Moreover, health problems and related concerns are, to some extent, idiosyncratic. Hence, one patient's satisfactory experience with a health care professional may not be a reliable signal for other patients of the latter's likely satisfaction about that professional.

It is widely acknowledged that the Internet is an extremely robust tool for collecting information about search goods. Indeed, the fact that computer equipment and travel and brokerage services have been prominent online

purchases during the early e-commerce experience attests to the advantages enjoyed by those selling search-type goods through e-commerce. Since price is an important searchable feature, the emergence of price-searching software will further enhance the advantages of electronic buying and selling of search goods.

The ability to electronically download free samples of certain types of experience goods expands the scope of e-commerce to many of these types of goods as well.¹⁶ For example, music and book publications, software, financial information and advice, and educational courseware, among others, can be downloaded by potential buyers to evaluate products on offer. Increasingly, the Internet will permit portraying product features in a context that approximates personal inspection. For example, three-dimensional software allows potential buyers of real estate to take online tours of the interior of houses. Similarly, buyers of designer clothing can have the fitting done electronically using scanners, and can be provided with pictures of how they will look wearing the designed products.

For experience goods that cannot be effectively sampled electronically, producers can try to reassure consumers about their qualitative attributes in more traditional ways, such as by investing in the creation of brand names, by offering product satisfaction warranties and so forth. In this regard, it is unclear how the Internet, *per se*, will affect the costs that producers need to incur in order to create the trust capital required to make their quality claims credible to potential customers. Traditionally, large accumulated sunk costs in brand names and trademarks have been used by firms to create trust with potential customers (Klein and Leffler, 1981). To the extent that the Internet allows firms to reduce (or avoid) the sunk cost investments traditionally required to market and promote experience goods, consumers may become even more concerned about deceitful marketing practices on the Internet, and the marketing of experience goods through e-commerce may suffer as a result.¹⁷ In this case, it may be incumbent bricks-and-mortar sellers that will succeed in e-commerce by leveraging the credibility of their historic sunk cost investments to build trust on the Internet.

It is also technically possible to distribute credence goods over the Internet. For example, some psychologists are selling their services online to clients, primarily through electronic mail. Medical doctors can also be contacted at Web sites to provide answers to health care-related questions, although diagnoses are usually highly qualified to minimize the risk of litigation.

The emergence of relatively low-cost video conferencing is allowing an increasing number of professionals to have face-to-face consultations with their online customers. Nevertheless, an individual's purchase of credence goods is likely to remain strongly guided by recommendations from close contacts such as family, friends and other professionals. Supporting this assertion is the observation that the vast amount of online medical information, to date, appears to be used by patients primarily to bring ideas and questions to their physicians, rather than as a source for identifying the services of physicians (Hafner, 1998).¹⁸

In summary, the main point of this relatively long discussion of search cost savings applied to different types of products is to highlight the relatively limited *a priori* range of products over which this potentially important consequence of e-commerce is likely to be relevant. Specifically, the search component of transaction cost savings is likely to be most substantial for traditional search goods and relatively inexpensive experience goods that can be electronically sampled. Certainly, the most successful B-to-C product categories, to date, support this assertion. Nevertheless, as consumers become more confident about the security of Internet payment systems, and as the willingness and ability of online merchants and auctioneers to ensure the integrity of their e-commerce offerings grow, the range of products benefiting from lower effective search costs should expand.

Other Transaction Costs

There has been less discussion, and much less of a consensus, regarding the impact of e-commerce on other types of transaction costs. It has been argued that the widespread adoption of standardized electronic contracts will lower the average cost of simple contracting, especially for B-to-B transactions, since a repetitive activity with relatively high variable costs will be replaced by an activity with relatively high once-and-for-all fixed and sunk costs but relatively low variable costs. Indeed, this notion underlies much of the speculation about the large technical efficiency gains associated with e-commerce.

The practical relevance of the claim that the Internet will facilitate a high degree of standardized contracting is uncertain. For one thing, there are unresolved legal issues surrounding the enforceability of e-commerce agreements, although recent legislation points towards some resolution of those issues in the foreseeable future.¹⁹ For another, it is unclear that transactions between parties, including those who regularly do business

together, are sufficiently standardized to obviate the need for contract modifications on an ongoing, and perhaps unpredictable, basis. This caveat is especially relevant for international transactions, where differences in legal regimes, contractual customs and so forth may oblige firms to enter into multiple agreements with a resulting loss of opportunities to standardize contracts and other agreements.

To the extent that the perceived risks of opportunistic behaviour are no lower for e-commerce activities than for conventional commercial activities, electronic contracts may need to be as complex and as frequently adapted over time as non-electronic agreements. In this case, the spread of e-commerce may have little direct impact on the costs of writing and enforcing commercial agreements. However, to the extent that the growth of e-commerce significantly expands the relevant geographic markets for certain products, buyers and sellers of those products should experience lower costs when switching transaction partners. Lower switching costs, in turn, should reduce incentives for individual market participants to act opportunistically, all other things constant, which should reduce the costs of establishing, maintaining and enforcing contracts.²⁰

Summary

A primary focus of current discussions linking e-commerce to productivity growth is the anticipated reductions in transaction costs. This section has identified, in particular, the strong prospects for a decline in search costs over a range of products. The somewhat lesser potential for substantial reductions in the costs of establishing, monitoring and enforcing simple contracts was also acknowledged. However, it is unclear that transaction costs reductions will be substantial enough to result in relatively large changes in overall economic efficiency. In particular, search costs may be difficult to reduce electronically for many types of products. Moreover, the market attributes that give rise to relatively high costs of contracting may not be attenuated by e-commerce unless the diffusion of e-commerce results in more competitive and contestable product markets. It is to this latter issue that we now turn our attention.

Competition and Contestability

“The Internet is severely curtailing retailers’ pricing power by giving consumers the means to compare different offerings with the simple click of a mouse.”

(Casey, 1999, p. A17)

Industrial organization economists view competition as both a structural and a behavioural phenomenon. Structurally competitive markets are characterized by relatively low levels of ownership concentration. That is, the largest sellers (or buyers) in a market enjoy relatively small market shares. Moreover, there are numerous market participants. Behaviourally competitive markets are characterized by vigorous price and non-price competition with rivals largely abstaining from what might be considered cooperative behaviour.²¹

Contestability is concerned with the influence that potential entry has on the behaviour of existing competitors. In a contestable market, the threat of entry is sufficiently compelling that incumbent sellers are obliged to behave in a competitive manner, regardless of the existing level of ownership concentration. Indeed, in a perfectly contestable market, the equilibrium price and output rate correspond to those that would obtain under perfect structural competition, even if there is only one seller in the market.

The predominant view of e-commerce is that it will promote increased competition. In particular, as noted above, reductions in search costs are expected to contribute to the expansion of relevant geographic markets that, in turn, should increase structural competition. The latter results from an expansion of the geographical scope over which firms can economically compete.²²

It has also been suggested that e-commerce will reduce barriers to entry, especially for small firms, thereby enhancing the contestability of product markets. Specifically, it is argued that e-commerce imposes much lower sunk-cost investments on sellers than does entry through more conventional commercial channels. For example, Solomon (1995) asserts that it costs as little as US\$1,000 a year to open and run an electronic storefront on the Internet that is accessible by as many as 20 million people. However, the explosive proliferation of Web sites is making it increasingly difficult for sellers to gain visibility on the Internet. In order to reach more easily individuals browsing the Internet, many online merchants are, therefore, using high-traffic search engines, such as Yahoo, as a springboard to their site. The owners of

such popular search engine sites, in turn, can be expected to charge listing fees that reflect the commercial advantages they offer.

Established sellers are also attempting to increase their success at e-commerce by using a *bricks-and-clicks* approach to the activity. The latter refers generally to the leveraging of brand names created in conventional marketing channels to promote selling efforts on the Internet. For example, the main online sports Web sites are attempting to increase viewership by cross-promoting with major events that they feature on other media, such as sister cable channels. As another example, Canadian banks are entering the U.S. market through a combination of Internet operations and physical branches (Greenberg, 1999). While it is almost certainly true that marketing through the Internet is cheaper than through purely physical channels, a complementary relationship between the two would presumably mitigate against easy entry by *de novo* firms in many product markets.

This caveat is especially relevant to the extent that costs associated with warehousing and shipping continue to represent a significant portion of the total cost of e-commerce.

Brand name spillovers from conventional distribution and media channels can be expected to increase the sunk costs of entry for *de novo* sellers by requiring the latter to invest substantial amounts of money in creating a unique brand name.²³ This condition is likely to be more relevant for sellers engaged in B-to-C e-commerce than for those engaged in B-to-B e-commerce. Nevertheless, even in the latter case, a reputation as a reliable supplier is usually required to gain access to the purchasing networks increasingly being formed by leading companies in a wide range of industries.²⁴ In some cases, acceptance into purchasing networks requires would-be suppliers to have an established reputation for reliability or a demonstrated capacity to meet supply commitments. To the extent that such requirements delay smaller entrants in realizing minimum efficient scale and/or oblige new firms to enter on a relatively large scale, with commensurately large sunk costs, e-commerce may be less of a boon to contestability than some early enthusiasts have contended.

In other cases, incumbent firms may be able to use e-commerce capabilities to augment first-mover advantages. An example is American Airlines' program to offer frequent fliers one-to-one marketing software. With this software, preferred customers can streamline their booking process by creating a profile of their home airport, seating and meal preferences and

so forth.²⁵ Another example is the effort of established brokers such as Merrill Lynch to bundle personalized advisory services with online trading as an integrated service offering in response to the emergence and growth of discount online trading services.

Some observers have also argued that we can expect online sellers to implement various strategies to reduce the transparency of prices in order to mitigate competition (Picot, Bortenlanger and Rohrl, 1997). For example, prices on the Internet might be quoted as a basis for further negotiation, rather than as a firm offer that will be filled if the buyer meets the quoted price. In this way, some price discrimination remains possible based upon the buyer's urgency for the product, the opportunity cost of the time she spends haggling over the product and so forth. The use of bundled pricing and complicated charging schedules can also obscure price differences among sellers.²⁶

The growth of industry group Web sites might facilitate non-competitive pricing by dominant sellers or buyers who comprise the group. Table 4 lists a number of recently announced group Web sites ostensibly implemented to reduce the costs of purchasing inputs, while Table 5 shows potential cost savings from B-to-B e-commerce in U.S. industries. What is unclear is whether the expected cost savings will come primarily from economies of scale and other real efficiencies, or whether they will be derived from the exercise of buying power on the part of large purchasers.²⁷ Obviously, only the first source of cost savings is relevant when considering the productivity benefits of e-commerce.

Table 4
Some Examples of Online Group Purchasing or Selling Sites

Industry	Firms Involved
Oil and Chemicals	More Than twelve Firms Including Royal Dutch/Shell and Dow Chemical
Specialty Metals	Eight of World's Largest Specialty Metals Firms Including Alcoa and Alcan
Personal Computers	Largest PC Makers and Component Suppliers Including Compaq, Gateway, and Hewlett Packard
Automakers	Ford and General Motors
Real Estate Firms	Thirteen Large Commercial Property Firms
Brokerage Firms	Charles Schwab, Fidelity Investments and two Other Firms (Electronic Network to Trade Stocks)
Railroads	Union Pacific, CSX and two Other Railroads (to Arrange Freight Transportation for Customers)
Lumberyard Chains	Wickes and five Other Lumberyard Chains

Table 5
Potential Cost Savings from B-to-B E-Commerce in U.S. Industries
(percent of total input costs)

Industry	Cost Savings
Aerospace Machining	11
Chemicals	10
Coal	2
Communications/Bandwidth	5–15
Computing	11–20
Electronic Components	29–39
Food Ingredients	3–5
Forest Products	15–25
Freight Transport	15–20
Healthcare	5
Life Science	12–19
Machining (metals)	22
Media and Advertising	10–15
Maintenance/Repair/Operating Services	10
Oil and Gas	5–15
Paper	10
Steel	11

Source: Coppel, 2000, p. 16.

To be sure, in some areas of B-to-B and B-to-C commerce, established multi-product *e-tailers* such as Amazon.com will be competitors to industry group Web sites; however, this source of competition is likely to be less robust, the more technically specialized the set of products being transacted. Likewise, auction sites such as eBay may not be seen as reliable alternatives to industry-run sites for buyers or sellers of products when small deviations from desirable specifications render those products inferior. This is especially likely if Web site participants enjoy well established reputations for reliable product quality and delivery.

Summary

While strong arguments have been made in support of the view that the growth of e-commerce will stimulate substantial increases in the competitiveness and contestability of many product markets, theoretical and practical considerations suggest caution. In particular, reductions in required sunk costs of entry may

be relatively modest to the extent that substantial investments are required to create brand awareness of new Web sites, as well as to offer security, privacy and other features of importance to online consumers. Indeed, substantial sunk cost investments in physical capital may be required in order to cultivate trust among those consumers. In this regard, existing firms with dominant marketplace positions in conventional distribution channels may enjoy substantial first-mover advantages in bricks-and-clicks competition.

Any evaluation of the potential impact of e-commerce on competition and competitiveness should also recognize the possibility that reductions in information costs may enhance the ability of incumbent sellers to exploit their market dominance more effectively. For example, it may enable those sellers to identify more precisely when they are able to increase price-cost mark-ups profitably. The Internet can also enable sellers to offer new services that are complementary to existing services. Such enhanced capabilities can potentially reinforce existing advantages of incumbency, thereby inhibiting the entry and expansion of new competitors. For example, airlines can utilize data collected on travel patterns and service preferences of customers to target specific promotions, such as seat sales on specific routes, to customers who tend to fly those routes.

In short, the conceptual linkages between e-commerce, competition and productivity growth belie some of the enormous enthusiasm expressed by many early commentators. In particular, it is not clear that e-commerce will prove a major boon to the contestability of markets. While it is not difficult to accept the working hypothesis that e-commerce will promote competition and, therefore, improved productivity in the long run, the magnitude and timing of that link are much more uncertain.

4. ASSESSING THE LINKAGES

In this section, an attempt is made to assess the available evidence on the potential linkages between e-commerce and productivity change. As the analysis presented in the previous sections suggests, the numerous direct and indirect potential linkages make any compartmentalized evaluation of the evidence difficult. Moreover, future changes in technology and public policy can either augment or diminish the strength of these linkages. Therefore, as a basis for reviewing the available evidence, it is useful to list several hypotheses that follow from the more general discussion of efficiency linkages provided above:

1. Reductions in search costs should lead to less market segmentation and increased price uniformity across geographical markets associated with e-commerce.²⁸
2. Increased information about demand characteristics should lead to increased multi-part pricing and, possibly, greater price dispersion across different groups of e-commerce market participants. Hence, there may well be conflicting forces influencing the uniformity of e-commerce prices.
3. The lower costs associated with altering electronic prices, as well as improved information about current market conditions should be accompanied by greater flexibility of e-commerce prices.
4. Increased competition should lead to lower prices, on average, for e-commerce transactions.
5. E-commerce transactions should have lower costs as a consequence of the reduction or elimination of various intermediation activities, since e-commerce makes it cheaper for final buyers and sellers to interact directly.
6. More timely information about market conditions should allow e-commerce transactions with less need for inventorying. Since inventorying is effectively a means to intermediate between current supply and future demand, this hypothesis is really one aspect of the preceding hypothesis.
7. To the extent that cheaper Internet communications can be substituted for physical inputs, such as printed materials, or for activities such as travel, e-commerce should lead to organizational changes in production that lower costs.
8. Reduced transaction costs should encourage increased contracting-out and other dealings among independent market participants.

Pricing

Some of the earlier studies comparing prices of goods purchased on the Internet to prices of the same products purchased through conventional channels found that the former were, on average, higher than the latter.²⁹ This result was not entirely surprising given the start-up costs facing new Internet sellers and the small initial sales volumes. Moreover, a problem with these comparisons, which remains to date, is that buyers gain certain advantages of convenience by purchasing on the Internet, and simple price comparisons may fail to take into account the convenience and other implicit cost savings that Internet shoppers enjoy. More recent studies, especially those focusing on products that are intensively purchased through the Internet, find that prices are about 10 percent lower, on average, than prices charged by traditional retailers (Coppel, 2000). However, there is substantial variation across product categories. For example, retail brokerage commissions for online trading have been substantially lower than traditional commission trades, although the latter have decreased substantially in the face of competition from online brokers.³⁰ On the other hand, there is no indication that the growth of online travel services has led to a decline in average airfares (OECD, 2000).

There are several possible explanations for the broad conclusion offered by the OECD that e-commerce has not led to substantial price changes in most product markets (OECD, 2000, p. 75). One is the previously cited possibility that consumers are paying higher prices online partly for the convenience offered by electronic commerce. A second is that cost savings associated with e-commerce, to date, have been small. A third is that sellers have been able to use better information to charge higher average prices in certain cases so that, on balance, e-commerce prices are not much lower than other prices. This result could be obtained either because some products sold in competitive markets were underpriced as a result of highly imperfect information or because sellers enjoy an enhanced ability to use price discrimination on the Internet.

Unfortunately, there is very little evidence bearing upon the price determination process in e-commerce transactions. Estimates of the impact of e-commerce on costs will be reviewed in the next section. There is some limited anecdotal evidence supporting the notion that sellers can and do charge higher prices for additional conveniences offered through online transacting. For example, Marriott International's prices for hotel rooms booked

on the Internet are higher, on average, than those booked offline, in part because unique amenities are offered in the former case, such as maps of tourist attractions and services surrounding Marriott hotels (Schlesinger, 1999). There is also evidence that improved information may lead to higher prices by significantly broadening the demand side of the market for specialized products. This seems to be the case, for example, in book retailing, where the Internet has brought prices down, on average, for common books, but appears to have inflated prices for rare books (Bensinger, 1999).

There is also some evidence to support the assertion that the Internet has not substantially changed competitive conditions in relevant markets. Consequently, a number of anticipated salubrious effects on prices have not yet been realized. For example, the substantial expansion of geographic product markets that some experts anticipated has arguably not yet occurred. A recent survey by Forrester Research, an Internet consultancy, estimates that 85 percent of online firms are incapable of shipping across borders. It is, therefore, unsurprising to see the estimate that exports beyond national borders account for only about 7 percent of European online retailers' revenues (Coppel, 2000, p. 18).

In this regard, the relevant issue is whether online transactions are intrinsically localized or whether the growth of e-commerce will eventually lead to substantial increases in international e-commerce trade. Obviously, one can only speculate on this matter. However, there is a growing perception among industry experts that regular Internet users prefer to make purchases at domestic Web sites. By dealing with local retailers, consumers can buy products using their own currency and avoid duties at the border. Thus, AltaVista found that when it launched its Canadian Web site, users complained that there were too many U.S. retailers selling their products in U.S. dollars. AltaVista now highlights retailers that sell in Canadian dollars and ship their products from Canada (Evans, 1999a).

It can also be argued that competitive conditions in domestic markets have not been fundamentally altered by e-commerce, except for some industries. As noted in an earlier section, there can be large sunk costs associated with establishing a commercially successful Web site, as well as significant first mover advantages. Forrester Research has suggested that large national merchants enjoy inherent advantages in technology, brand and scale that contribute to their e-commerce success.³¹ This tends to be

confirmed by survey findings that the majority of small firms do not see profitable opportunities to engage in e-commerce.

Several other empirical observations have been made about online pricing behaviour. As expected, prices tend to change more frequently online, presumably reflecting lower “menu” costs (Coppel, 2000). However, price dispersion is apparently no less online than offline (*ibid.*). From the latter result, one might infer that there is much more customization of pricing on the Internet, but this is apparently not the case. For example, the OECD (2000, p. 74) reports that among the 100 largest firms engaged in B-to-C e-commerce, less than 1 percent dynamic price negotiation or customization was present in one form or another in less than 1 percent of cases. This latter finding, combined with the observation about price dispersion on the Internet, suggests that, to date, the efficiency of the pricing mechanism has not been significantly improved by e-commerce. Two additional observations are relevant in this regard. One is that, of the previously mentioned sample of the 100 largest firms, about half displayed no price information on their Web sites. A second is that less than 5 percent of these firms listed prices of competing products (OECD, 2000).

Costs

While there are a range of potential direct and indirect transaction costs savings associated with e-commerce, as noted above, it has been suggested that the evidence on cost impacts can be summarized with reference to three broad categories: 1) the costs of executing sales; 2) the costs associated with procuring production inputs; and 3) the costs associated with making and delivering products (Coppel, 2000).

Costs of Executing a Sale

These costs encompass a set of activities including the establishment and maintenance of a point-of-sale, order placement/execution, customer support, after-sale service, and staffing.

As noted in an earlier section, the cost of establishing a Web site can vary widely depending upon the features of the site, how much promotion is done and so forth. Thus, one sees estimates ranging as widely as \$20,000 to hundreds of millions of dollars (OECD, 2000, p. 59). This range makes it difficult to compare the cost of establishing a Web site to the cost of

establishing a physical point-of-sale. Nevertheless, the general consensus is that it is less expensive to maintain an electronic storefront than a physical one, primarily because the former has few variable costs and eliminates duplicate inventory costs. Reliable estimates of the relevant cost differences are, however, unavailable.

The dissemination of online information enables consumers to be better informed about relevant attributes of the purchasing activity. This, in turn, reduces the expenditures firms must incur to inform consumers about the availability of products, relevant product features and so forth. Some estimates of the cost savings associated with online order placement and execution exist. For example, Micron Computers reports a productivity gain of a factor of ten. Specifically, their Web sales people spend, on average, two minutes on the telephone with customers who have looked at their Web site, but 20 minutes with traditional customers (OECD, 2000, p. 60). Auto dealers claim similar gains. They report spending about \$25 to deal with an e-commerce bid, but several hundreds of dollars for a face-to-face transaction. Of course, these estimates ignore the costs assumed by consumers to obtain online information, including productive time lost at work.³²

Estimates are also available on the cost savings associated with using the Internet to provide customer support and after-sale services. For example, Cisco Systems has moved 70 percent of its customer support online and claims to have saved over \$500 million, or 17 percent of its total operating costs on that activity. Estimates by Forrester Research show savings of a much larger order of magnitude. The firm estimates that it generally costs \$500 to \$700 to send a service representative into the field, \$15 to \$20 to handle a customer question over the telephone, and about \$7 per client to set up and maintain an Internet-based customer service system.

Yet another source of cost savings is the reduction in required staffing levels associated with executing sales. Again, the limited sources of evidence are largely anecdotal. For example, Federal Express reports that its online customer service system has obviated the need for some 20,000 new hires, or about 14 percent of its total work force.

Procurement of Production Inputs

By reducing the time required to carry out the purchasing cycle for inputs, online buying allows firms to economize on inventory. It also reduces staffing requirements to carry out that function. According to a study by Goldman Sachs, as cited in Coppel (2000), the relevant cost savings range between 2 and 40 percent of the total costs associated with this activity depending on the industry. This range encompasses a more specific estimate of cost savings in purchasing inputs through e-commerce of 30 percent for a consortium of oil and chemical companies (Bahree, 2000). It also encompasses Quaker Oat's estimate that bidding for food ingredients, packaging and services online has led to savings of around 14 percent in the costs of procuring inputs (Hof, 2000). It is unclear whether all of these estimated cost savings reflect real resource savings rather than enhanced market power associated with coordinated purchasing through the Internet.

Distribution

For products that can actually be delivered through the Internet, large cost savings, on the order of 50–90 percent, can be anticipated compared to delivery through conventional channels (OECD, 2000, p. 64). For tangible goods that still require physical distribution, e-commerce methods are estimated to reduce administrative support costs by over 25 percent. Direct distribution over the Internet also reduces the conventional costs associated with intermediation. The OECD (2000, p. 65) estimates that there will be disintermediation cost savings of around 14 percent at the wholesale level and of 25 percent at the retail level, for total cost savings of around \$2 trillion. At the same time, there will be new forms of intermediation associated with e-commerce whose costs should be set against the savings associated with the contraction of traditional intermediation activities.

Summary

The wide range of cost savings estimates, as well as the limited number of such estimates, make it impossible to draw any inferences confidently, other than to suggest that e-commerce is likely to lead to significant cost savings in specific economic activities. The impact on productivity growth will, in turn, depend upon whether the cost savings are largely continuing, rather than once-only, and on the growth of sectors that are strongly impacted by e-commerce relative to sectors that are less impacted.

The OECD (2000, p. 72) offers an economy-wide estimate of total cost savings associated with the adoption of e-commerce for OECD member countries. Specifically, it estimates that economy-wide costs will be reduced by about one-half to two-thirds of a percentage point. The OECD suggests that these cost savings are a proxy for total factor productivity (TFP) gains. Since annual TFP growth averaged only around 0.8 percent for the G-7 economies over the period 1979–97, the OECD's estimated impact of e-commerce on productivity is relatively substantial. Moreover, it is suggested that the estimated productivity gains are probably conservative, since they do not account for the welfare gains associated with increased customer choice and a closer matching of consumer tastes and preferences to product availability.

It might be noted, in passing, that the growth of e-commerce could stimulate investments in modern information technology, which should promote improved productivity. While the precise contribution of modern communication infrastructures to productivity growth is subject to some disagreement, the preponderance of the evidence supports the notion that it has been significant (Schreyer, 2000).

5. POLICY ISSUES

A number of fairly familiar policy issues arise in the context of the linkage between e-commerce and productivity. The issues bear upon the magnitude of the gross benefits from the spread of e-commerce, as well as the costs associated with its implementation.

International Agreements

A significant portion of the economic benefits from e-commerce derives from the expansion of geographical markets. The effective expansion of geographical markets internationally, in turn, will depend upon the legal regime surrounding both the technology platform over which e-commerce transactions take place, as well as the economic activities significantly affected by e-commerce. While the electronic marketplace is currently free from explicit trade barriers, the infrastructures that make e-commerce possible are still burdened by a myriad of trade and investment barriers. Notable sectors include telecommunications, financial services and distribution.³³

Of particular concern for Canada, in this regard, are direct and indirect foreign ownership restrictions in sectors such as basic telecommunications, banking, and air transport. To the extent that capital investments in these key sectors are essential to facilitate efficient e-commerce transactions, foreign ownership restrictions may constrain the diffusion of e-commerce activities in Canada by discouraging domestic access to the package of technology and skills typically bundled into the capital investments made by multinational companies.

While the issue of foreign ownership is an old one in the Canadian policy context, it is relatively new in the international context as applied to service industries such as telecommunications and banking. Moreover, e-commerce is a service that cuts across these and other traditional service industry classifications. As such, there would seem to be an important policy issue about how e-commerce should be treated under existing international commitments. To the extent that Canada wants to maintain its protection of domestically owned telecommunications and financial services firms, for example, it might be preferable to treat e-commerce as an activity covered under the General Agreement on Trade in Services (GATS), which would make its treatment less liberal than under legislation dealing with trade in goods. The main point here is that Canadian policymakers may want to reconsider the broad range of sectoral policies restricting foreign ownership and participation in domestic economic activities in light of the potential for those policies to mitigate the economic benefits of e-commerce.

International agreements in other related areas are also increasingly seen as necessary to promote the adoption and effective use of e-commerce. Examples include laws and regulations governing privacy and the security of transactions on the Internet. These issues have been extensively discussed elsewhere and will not be revisited here. It seems innocuous to recommend that Canada participate actively in international forums devoted to addressing these issues. Less innocuous is the issue of whether the optimal forum for addressing these issues is at the multilateral level or the regional level. Given the overwhelming degree to which Canada's economy is integrated with the U.S. economy, it might be argued that negotiations surrounding the international regulatory and legislative framework for e-commerce would most fruitfully be conducted on a bilateral basis, especially given the extensive lead that the United States and, to a lesser extent, Canada enjoy in online transacting.

Competition Policy

As noted earlier in this report, a variety of cooperative arrangements are being pursued by leading firms in a wide range of industries to leverage the benefits arising from jointly operated Web sites. Concerns have been expressed that such arrangements might facilitate price coordination in buying, or selling, products, as well as create or accentuate barriers to entry for suppliers who are denied access to industry Web sites.

While it is certainly not obvious that existing competition policy legislation and jurisprudence are insufficient to deal with competition problems arising from e-commerce activities, the nature of the cooperative agreements being promulgated fall into a policy area that has not been actively dealt with, to date. Namely, cooperative agreements, including joint ventures, have not yet been the subject of close and active scrutiny under Canada's competition policy framework. It might therefore be useful to examine the potential competitive implications of such agreements with a view towards identifying whether and how traditional policy criteria and remedies may need to be adapted to address changes to the business practices environment brought about by e-commerce. To the extent that cooperative arrangements involve Canadian and U.S. firms as some already do, in metals for example, increased intersections between U.S. and Canadian competition policy initiatives might be anticipated. Therefore, an examination of the conceptual and practical issues raised by increased cross-border cooperative business practices through e-commerce activities might also be warranted.

Agglomeration Economies and Domestic Industrial Policies

While not explicitly discussed in this report, the general opinion expressed in the relevant literature is that the growth of e-commerce is a force for dispersing the geographical concentration of economic activity that has been observed in a wide range of industries, including modern service and high technology industries.³⁴ In fact, there has arguably been very little reliable evidence produced to confirm or deny the generalized validity and significance of this hypothesis. Given the existing regional differences in the concentration of higher value-added activities in Canada, the potential role that e-commerce might play in augmenting, or mitigating, those differences is a potentially important policy issue. It might thus be useful to undertake a number of careful case studies of specific economic activities, such as financial services, that have already been substantially impacted by e-commerce. The case studies would presumably focus on whether and how the growth of e-commerce has influenced the geographical distribution of specific activities comprising an industry's value chain.

Conclusion

At this relatively early stage, one can only speculate about the economic impacts of e-commerce, including its effects on industrial productivity. Nevertheless, it can be argued at this point in history that theory and early evidence point to the likely economic consequences of e-commerce as being evolutionary rather than revolutionary. In this regard, there is, in my view, a real danger that public policies will tilt unduly towards promoting directly or indirectly Internet-based business activities while failing to recognize the costs imposed on conventional economic activity. For example, subsidies provided to so-called *dotcom* companies may have the unintended consequence of increasing resource costs and otherwise disadvantaging traditional wholesalers, retailers and other offline sellers.³⁵ Unless productivity spillovers from e-commerce are significantly larger than those from conventional forms of commerce, there may be little theoretical justification for promoting of e-commerce as a public policy goal. This is especially so given the documented and substantial deadweight costs associated with government tax and subsidy programs. To date, the economic case for emphasizing the promotion of e-commerce is speculative.

NOTES

- 1 A closely related definition identifies e-commerce as covering every type of business transaction in which the participants prepare or transact business or conduct their trade in goods or services electronically. See OECD, 2000.
- 2 To the extent that B-to-B transactions are 5 to 6 times greater than B-to-C transactions, the value of B-to-B e-commerce would be around US\$30 billion. See Mann, 2000.
- 3 Available evidence suggests that e-commerce is an even smaller phenomenon in other developed countries including Canada. For example, e-commerce sales in Canada for 1999 are estimated to be only around 3 percent of all North American e-commerce sales. See Evans, 1999b.
- 4 See "Is That E-Commerce Roadkill I See?," *Business Week*, September 27, 1999, p. EB96.
- 5 See "A Hard Sell Online? Guess Again," *Business Week*, July 12, 1999, p. 142.
- 6 See "Internet Retail Activity by Canadians," *The Globe and Mail*, January 28, 2000, p. E5.
- 7 We abstract here from considerations of "second-best" and other qualifications. For purposes of this report, such considerations are unnecessary.
- 8 Real output, in this context, conceptually encompasses quality improvements (including enhanced variety) that are associated with improved consumer welfare.
- 9 Such reorganizations can, in turn, give rise to improvements in allocative and technical efficiency.
- 10 Many of these social infrastructure costs are discussed in detail in Mann, 2000.
- 11 The precise nature of the potential relationship between the two phenomena will be considered in more detail in the next section.

- 12 This categorization of transaction costs is discussed in Wigand, 1997. An important component of search activity is the verification of the claimed attributes of products. Where it is difficult for producers to validate their product claims, markets may be characterized by a “lemons” problem, and reliable producers may be driven from the market. For a discussion of this phenomenon on the Internet, see Lu, 1998.
- 13 Collectibles, such as rare books, are obvious examples of this type of product.
- 14 It has also been suggested that electronic commerce facilitates more complex pricing arrangements that, in turn, could allow sellers to employ more efficient multi-part pricing schemes.
- 15 A brief discussion of the distinction between search and experience goods is found in Carlton and Perloff, 1994, pp. 596–8.
- 16 The phenomenon also raises concerns about appropriation of intellectual property on the Internet, as the recent case involving Napster illustrates. The costs associated with public and private sector efforts to address those concerns are part of the costs of adopting e-commerce as noted in an earlier section of the report.
- 17 This point is also made in Lu, 1998.
- 18 To be sure, treatment protocols of some health care providers may be improved by the information that is brought to them by patients. As well, health professionals may find it cheaper and more convenient to search for information on the Internet than through traditional sources such as journals and medical society publications. The use of the Internet to access health care information has grown dramatically. For example, one recent estimate asserts that half of all consumers who access the Internet are seeking health-related information (Tyson, 2000).
- 19 For example, recent U.S. legislation affirms that electronic “signatures” are as binding as non-electronic signatures on legal contracts.
- 20 For an extensive discussion of how the transaction costs of commercial outsourcing are affected by environmental features such as competition, see Vining and Globerman, 1999.

- 21 Cooperative behaviour is also sometimes characterized as “conscious parallelism”. For a discussion of this type of behaviour, see Greer, 1992, pp. 394–9.
- 22 For an enthusiastic statement of how e-commerce spells the end of geography and borders as industrial organizational constructs, see Kobrin, 1995.
- 23 According to some estimates, it costs a minimum of US\$100 million to launch a commercially viable Web site. This includes off-line advertising. See Sarkar, 2000.
- 24 Relatively recent examples of large firms establishing Web sites to engage in combined purchasing and/or selling are provided in Table 4.
- 25 See “Now It’s Your Web,” *Business Week*, October 5, 1998, pp. 164–78.
- 26 Suppliers can also search the Internet to see the availability of substitute products and, subsequently, increase prices when they identify a limited availability of substitutes. See Schlesinger, 1999. For a discussion of computerized “smart pricing,” see “The Power of Smart Pricing,” *Business Week*, April 10, 2000, pp. 160–2.
- 27 The potential for members of buying groups to coordinate their selling prices is also a relevant risk in some cases.
- 28 The assumption that all other things are held constant is implicit in each hypothesis.
- 29 For an extensive review of available studies, see Coppel, 2000.
- 30 One estimate is that the average brokerage commission in the United States will plummet from around \$80 per trade in 1998 to around \$30 per trade in the next year or two (Buckman, 1999).
- 31 See “E-Commerce Seen as No Boon to Small Business,” *The Globe and Mail*, July 29, 1999, p. B12.

- 32 One report recently proclaimed that “cyberloafing” accounts for 30 to 40 percent of lost worker productivity and estimates the price tag at \$54 billion annually. As a result, most major companies are recording and reviewing their employees’ electronic communications. This monitoring, in turn, imposes its own real costs. See “Workers, Surf At Your Own Risk,” *Business Week*, June 12, 2000, p. 105.
- 33 For a more detailed discussion of these barriers, see Mann, 2000.
- 34 A review of the theory and evidence on this matter is provided in Gliberman, 2001.
- 35 Surveys show that, to date, e-commerce sales have largely come at the expense of sales made by physical stores or mail catalogues. See, for example, “Is that E-Commerce Roadkill I See?,” *Business Week*, September 27, 1999, p. EB96.

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