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Developing Countries in the New Economy

The Role of Demand-side Initiatives

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Abstract

Past breakthroughs in communication technology—the invention of the printing press and the telegraph—led to major economic upheavals. What are the implications of the more recent information and communication technologies (ICTs) for the developing world? Optimists believe that modern ICTs will allow developing countries to catch up with the developed world, while pessimists claim that the growing digital divide will reinforce economic divergence. One significant lesson from history is that mere access to new technology is not sufficient for economic transformation. The presence of so-called network effects makes the outcome sensitive to patterns of demand and usage of new technologies. This may make a case for demand-side initiatives, include government sponsorship of, and direct participation in, new technologies. The paper uses examples to highlight the key issues and specify some policy conclusions.

Keywords: ICT, developing countries

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1 Introduction

Some breakthroughs in communication technology—for instance, the invention of the printing press or the telegraph—were followed by major economic transformations. Similarly, the development of the railway networks in the nineteenth century had dramatic effects on the pattern of trade and production in the global economy. This paper examines how the ongoing information and communication (ICT) revolution is likely to affect the global economy, and implications for public policy in the developing countries.

It is customary to argue that the emergence of the so-called new economy has presented developing countries with new opportunities for success but at the same time increased the risk of their marginalization. To elaborate on these alternative possibilities, two extreme scenarios are usually presented. In the optimistic scenario, new information and communication technologies allow developing countries to bridge the technological gap that exists between them and the developed world, enabling them to catch-up with (and, with sufficient optimism, even 'leapfrog' over) the current economic leaders. The alternative, dismal scenario, is that new technologies will enable faster growth in the developed world, and the developing countries will languish. In this scenario the current digital divide will create the basis of greater divergence in economic outcomes, both between the developed and developing worlds, and within countries. Of course, both scenarios lead to the same policy imperative: the idea that developing countries need to invest more in ICT, if not to catch up, to prevent being left behind in the digital race.

It is hard to deny that participation in the new economy is extremely unequal at the moment. Access to the Internet is a measure commonly used to quantify the digital gap. For instance, it is estimated that in 2000, a fifth of the world's people living in the richest countries have 93 per cent of Internet users (and 86 per cent of the global GDP), while the bottom fifth have only 0.2 per cent of Internet users.[1] Inequality in access to the new economy exceeds income inequality. While access to the Internet is a much-discussed statistic, it is instructive to consider inequality in access for older and more basic forms of communication. Thus, while there is universal access to telephones in the developed world, in developing countries less than 10 per cent of the population have access to telephones. Hammond (2001) estimates that more than half the world's population have *never* made a phone call.[2]

How does this manifestation of global inequality compare, on the scale of development priorities, to other forms of global inequality? Specifically, how do we compare digital poverty to more conventional forms of poverty in the developing countries—lack of access to nutrition, basic healthcare, safe drinking water, and to education? Should the developing countries divert scarce resources from these sectors in order to close the digital gap?

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1 See United Nations (2000). Similarly, UNDP (2001) estimates that in 2000, 79 per cent of the Internet users lived in high-income OECD countries, which contain only 14 per cent of the global population.

2 The International Telecommunications Union (ITU) provides detailed country statistics on telecommunications access. While the ITU aspires that each country works towards *universal access*, it is sobering to note that this is defined as everyone in a country living within five kilometers of a telephone.

It is hard to believe that new technologies alone can address the basic needs of the poor in developing countries.[3] Rather, it is sometimes claimed that new technologies matter because they offer a faster growth path out of poverty. The validity of this argument, which emphasizes the investment aspect of ICT, depends on the link between technology and productivity growth. While the issue has been debated, most people would accept that modern ICT has had some positive impact on productivity. Jalava and Pohjola (2001) offer evidence in support of this for two advanced economies. Of course, in these economies, the adoption of modern technologies has been incremental and at the same time, innovation has occurred in response to specific needs. What is the relevance of these technologies for countries that are at a more primitive level of technological achievement? In other words, what is the social rate of return to ICT investment in developing countries? Further, can the design of appropriate institutions and policies improve the likelihood of the optimistic outcome, i.e., convergence, over divergence?[4]

2 The lessons of history

In the long sweep of history, the industrial revolution presents a fascinating study of rapid economic transformation. In eighteenth-century Britain a series of technological innovations made it possible to mechanize production, that is, to use machines run by inanimate power to speed up repetitive tasks. Simultaneously, the creation of the factory system—a crucial innovation in the organization of production—made it possible to translate the benefits of mechanization into higher and cheaper output. Together the innovations in technology and in the organization of production led to a dramatic increase in productivity. While by modern standards the increase in the rate of economic growth was small, over time it transformed the economy and the social order in Britain.

Other countries followed suit with their own industrial revolutions, but broadly speaking this process was confined to a handful of countries in Western Europe. The real paradox is that even as the accompanying improvements in transport and communications made the world a much smaller place, the industrial revolutions fragmented the globe by creating vast economic differences between industrial and pre-industrial societies. Steam-powered ships could circumnavigate the earth with great speed and reliability, but the economic gap between Western Europe and Asia widened.

It is tempting to conclude that technology has the power of rapid economic transformation. However, while technological innovation may be necessary for an industrial revolution, historically it has hardly been sufficient. As Quah (1999) has pointed out, China's technological achievements in the fourteenth century were comparable to those that culminated in the industrial revolution in Britain four centuries later.[5] Yet, despite its technological readiness, there was no industrial revolution in

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3 It is sobering to note even the champions of the new economy, such as Microsoft founder Bill Gates, do not believe that investment in IT can solve the major problems of the developing world. Much of the philanthropic work of the Gates Foundation aims to tackle the familiar problems of hunger, access to drinking water, eradication of disease and illiteracy in developing countries.

4 For a general discussion of policy choices, see UNDP (2001) and UN (2000).

5 The Sung (960-1126) and Yuan (1127-1367) dynasties witnessed substantial technological progress. Quah (1999) notes that fourteenth-century China 'had solved the problems of making agriculture

China at that time. Even more surprisingly, the speed of technological innovations withered away from the fifteenth century onwards, and China's technological lead soon vanished. Why did an industrial revolution not occur in fourteenth-century China? Even more surprisingly, why did technological development come to a halt, and perhaps even regress, from the fifteenth century onwards?

In other words, technology alone cannot explain industrial revolutions in Western Europe. The causes of European 'exceptionalism' remain a subject of academic debate. One traditional view has been that while technology played an important and visible role, industrial transformation required other essential ingredients. In order to invest in new technologies, it was necessary to have access to capital and modes of finance that insulated individuals from excessive risk; to have the right balance of skills to use the new technologies; and the entrepreneurial spirit to engineer and embrace change. We could label these other crucial ingredients as 'social capital'. Thus, the argument goes, while technology could be copied or acquired at some cost, social capital was much harder to replicate. On a slightly different note, Pomeranz (2000) emphasizes the role played by Britain's Atlantic trade in relieving the scarcity of land and energy.[6] Quah (2002) conjectures that China's inability to exploit its technological base could be attributed to a failure of demand for technology. The Chinese state, which had long provided patronage for new technologies and exercised strong control over access to these technologies, seemingly withdrew its support after the fifteenth century, and this led to technological blight. Regardless of which missing factor we hold responsible for failure, even a cursory examination of history alerts us that investment in technology, by itself, is unlikely to put the developing countries on a higher growth path.

A second historical lesson comes from the growth of railway networks in the nineteenth century. The railways were the superhighways of their era, and there are remarkable similarities between the Internet boom of the 1990s and the 'railway mania' of the 1840s. Interestingly, as Chancellor (1999) records, contemporary pamphlets and journals spoke of the railways not just as a new form of transport, but as a revolutionary advance unparalleled in the history of the world. Indeed, the arrival of the railways was celebrated as a *communications revolution*.[7]

Widespread enthusiasm about the new technology led to a surge in the number of railway construction companies, generating a stock-market boom. However, by the late 1840s, most of these railways companies had folded, with substantial losses for

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highly productive, efficiently manufacturing fine textiles, exploiting and applying kinetic and thermal energy, and producing high-quality materials for tools'. China led the world in the use of coke-fuelled blast furnaces for smelting iron (eleventh century), the widespread use of the vertical water wheel (thirteenth century onwards), water-powered spinning machines (twelfth century), gunpowder, paper, chemicals: many of these were not available in Europe till many centuries later.

6 As Pomeranz (2000: 68) puts it, 'European science, technology, and philosophical inclinations alone do not seem an adequate explanation, alleged differences in economic institutions and factor prices seem largely irrelevant'.

7 As one paper declared, '... the length of our lives, so far as regards the power of acquiring information and disseminating power, will be doubled and we may be justified in looking for the arrival of a time when the whole world will have become one great family, speaking one language..' (quoted in Chancellor [1999: 126]). There is a striking similarity with Negroponte's (1995: 230) more recent claim that 'digital living' would 'reduce man's dependence on time and space, close the generation gap and lead to world unification'.

shareholders. Notwithstanding this boom and bust, the railway network expanded dramatically over time, both in Europe and in other parts of the world. The economic impact of this expansion was very marked. By enabling the low-cost movement of materials, manufactured goods and people, the railways had a profound influence on global patterns of production and consumption.[8]

While the benefits of the railways were global, the distribution of these benefits was unequal across the globe. Britain was the leading beneficiary. The railway boom provided a major spurt to industrial Britain in various ways. First, the construction of railway networks in its overseas colonies provided a direct boost to British steel and construction industry. Second, the railway network extended the reach of British industry: both by allowing them to access raw materials from the colonies and by expanding their markets for manufactures. In contrast, the implications for the colonies were mixed. For instance, handicraft cloth weavers in India could no longer compete with the cheap cloth milled in Manchester and went out of business. The railways encouraged a shift in agriculture from food crops to cash crops, but the greater volatility in demand for cash crops exposed subsistence farmers to greater risk. Some of these costs were only transitional and soon outweighed by the long-term benefits of railway networks, but Britain gained more than others did countries.

These historical examples have some lessons for the new economy. One, the experience of the industrial revolution tells us that while new technology plays an important role in economic transformation, other ingredients may be necessary. We must guard against a new 'technological fundamentalism'—the idea that new technology is the crucial need of the developing world—without a careful assessment of other potential constraints faced by developing countries. Two, the salutary lesson from the early growth of the railways is the benefits of new technologies are often distributed asymmetrically, with some nations gaining more than others.

The second point merits elaboration. In the new 'network economy', the asymmetry of distribution of benefits may be even stronger, given its winner-takes-all characteristic. Many sectors of the modern information economy have the feature that the pioneer captures all the benefits and there are no prizes at all for being second. In particular, the first-mover advantage of many US-based corporations may enable them to capture a disproportionately large share of the gains. As in the railway example, the pioneering firms are likely to benefit from the dominant role they will play both in the construction of the network infrastructure, and in the use of the network to access and create markets for the emerging 'information industry'. Not surprisingly, then, it is precisely these firms that are the cheerleaders of the new economy.[9]

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8 In Britain the impact on life and society went further. The railways served to 'unify time' (i.e. church clocks were synchronized to the railway clocks); the possibility of overnight transport from London to the home counties made it feasible to have a daily national newspaper. The dramatic reduction in transport costs allowed factories to reduce their inventories, with substantial gains.

9 As Schiller (1999) argues at great length, the strongest advocacy of the 'need for rapid global expansion of telecommunication networks' has come from the mostly US-based corporations that are most likely to benefit from it. They have come to acquire strong influence in the multilateral agencies that manage the telecommunications agenda. Their representatives 'travel the globe, articulating visions of exponential growth and explaining the magic of Moore's law and exponential growth'.

If so, we should admit the possibility that the new economy can increase the gap between rich and poor countries. This outcome is consistent with two alternative scenarios: in the first scenario resource constraints prevent poor countries from acquiring access to information technology, and the resulting *digital gap leads to an economic gap*. But there is a second scenario in which the developing countries invest a lot of resources (diverted from other pressing needs) to *close the digital gap, and yet cannot catch up in economic terms.* In the latter scenario, from the developing countries' point of view, the new economy would become an expensive distraction.

Despite the latter possibility, I do not believe it is an option for developing countries to turn their backs on the new economy. Rather, it only reminds us that the strong claims made by the proponents of the new economy cannot be taken at face value. The success of the pioneers may not be replicated, at least not to the same extent, for the latecomers in the new economy. Indeed, Gordon (2000) has argued that new economy may not quite measure up to the great inventions of the past. If so, the case for investing in the new economy needs to be made on a more pragmatic and piece-meal basis.

Lest this sound too negative, some caveats. First, the overall gain from the global network—the digital dividend—is probably very large: through the choice of the right policies, developing countries can improve their share of this dividend. Two, while the network advantages tend to work against developing countries, in some cases, developing countries (especially large developing countries) can turn the balance of advantage in their favour. I will consider these two issues in turn.

3 The nature of the new economy

The new economy involves a growing importance of 'knowledge products' in the total output of the economy. This includes not only computer software, but also other services that can be delivered digitally (such as news, entertainment, music, and data). One relevant feature of knowledge products is that they are costly to produce but cheap to reproduce. To take an example, it takes thousands of hours of costly programming time to produce a useful piece of commercial software but once the software code has been written, it is extremely cheap to make a perfect copy. If copying is freely allowed, people will be able to acquire this software very cheaply, reducing the financial reward for the producer of software. To provide the incentive to produce knowledge products, society must institute a regime of intellectual property rights, or find other means of encouraging creativity.

A second characteristic of knowledge and knowledge products is that it is often hard for a user to assess their value till they have experienced them. Take the Internet, for example. People who have not used the Internet find it hard to appreciate its usefulness. Experienced users realize what it can do (and what it cannot do). The more experience you gather, the more you come to value the Internet. Like the Internet, many other innovations in the information economy are experience goods. In this sense these innovations differ from previous technological innovations, whose 'magic'—think of electricity or the motor car—was relatively easy to appreciate by most people, whether or not they had used these themselves.

A third aspect of the modern information and communication technologies is the network character of the services they enable. For instance, the value of any communication network depends on the total number of people in the network. The greater the number of people that participate in the network, the greater the value of joining the network. If you are the only person in the world with a phone connection, it is of no use. If many people have phones, it is useful to have a phone yourself. The returns to participating in the network increase with the number of other users.

What are the consequences of these three characteristics of the new economy for developing countries? The network aspects, combined with the characteristic that information goods are experience goods, have some serious implications. In digitally-rich economies, people have already experienced many knowledge products and, over time and with experience, come to value them highly. This has resulted in increased consumption of information goods and strong participation in the new economy. This makes the network even more valuable, increases the availability of new information goods, thus increasing the incentive to participate even further. In sum, the use of networks is self-reinforcing. On the other hand, in digitally-poor economies the same mechanism stifles growth. In the absence of sufficient experience, the consumption of information goods remains low. As a result, the value of information networks is small, and participation is low. This problem may not be so acute in large developing countries like China and India where the size of the economy mitigates the poverty of networks. But in small developing countries, the absence of critical mass poses a serious obstacle to participation in the new economy.

4 Policy implications

How can this vicious circle be broken? The network aspect creates that possibility that free markets alone will not result in an efficient outcome. It is useful to remember that the Internet arose out of publicly funded research in defence communications networks. Public agencies will have a crucial role to play in its extension in developing countries. By public agencies I refer primarily to the national governments but the list also includes non-governmental organizations (NGOs) and international agencies operating in developing countries.

The potential benefits of modern ICTs for developing countries can come through various channels. The *production* of new-economy goods and services—say, computer hardware and software—can add to total output in the economy. The *exports* of these products can serve as an engine of growth. The greater *use* of ICT in the existing sectors of the economy can result in productivity improvements, say by reducing inventory costs. Apart from the direct or indirect contributions of ICT for output or exports, the *consumption* of ICT would provide direct benefits to the population: communication is, after all, a basic need at all stages of development. How likely is it that these potentials will be realized?

4.1 E-government and demand-side initiatives

In many developing countries, the government remains a major agency of social change. Government agencies in developing countries could boost demand for information

goods and services by becoming a consumer of new technologies, and thus provide critical mass for their widespread adoption. This, in my opinion, will serve various functions. One, by increasing demand for technology-intensive products, it will increase the incentives for the private sector to invest in the provision of these services. Two, new technologies have the potential to improve the efficiency of the public sector. Three, public use of information technology may speed up the diffusion of these technologies through a demonstration effect.

To appreciate this, consider another railway example. Much before the current Internet revolution, the Indian Railways, a public-sector enterprise, replaced its 100-year old paper-based reservation system by a more efficient, centralized, computer network. Under the old system, allocation of scarce capacity among intermediate points on the route of a train journey required numerous telegraphic exchange of information. The new electronic system made it possible for travellers to make reservations for travel originating from remote locations, with considerable benefit for passengers. But it also led to great strides in domestic development of software, among other things, to handle India's numerous languages and scripts. The crucial fact is that a government department became a major user of information technology, and thus boosted demand for new technology. The supply of the technology was left to private enterprise, with some in-house development. Once the technology ball had started rolling, it acquired its own dynamic and created many useful offshoots.

The government interacts with people through various channels. One idea might be to use modern ICT as an *additional* channel of communication with the public, by creating what is often called e-government. This will boost demand for elements of the new economy, and the use of modern technology may also improve governance. Modern ICT can simplify many routine tasks. Electronic mail can speed up internal communication. The use of databases can improve storage and retrieval of information, and reduce paperwork in public administration. Electronic voting mechanisms can reduce the costs and errors in election processes and increase public confidence in democratic structures. The Internet can be used to communicate government policy and regulation, and increase transparency of governance. Government sponsorship of such activity will also generate local language content for local needs. This may catalyse the demand for further information services.

Of course, progress of e-government faces many hurdles in developing countries. First, investing in new technology requires resources that many developing countries do not have. Apart from financial resources, it requires training and skilled personnel: public sector salaries are often below the levels necessary to attract these skills. Expensive equipment is frequently misallocated: new computers often adorn ministerial desks as status symbols, rather than serve as productivity-enhancing tools at lower levels of government operation. More importantly, while the lack of enthusiasm about e-government is blamed on inertia and incomprehension, often there is a more serious constraint: that many civil servants have a vested interest in preserving the status quo. Knowledge and control over information flows is usually a source of power in hierarchical bureaucracies. To the extent that freer access to information will undermine this power, we should expect a lack of enthusiasm about new technologies. In labour-surplus economies, there is additional concern about the displacement of labour by machines. For instance, the computerization of records in the public-sector banks in

India has been resisted by the trade unions on grounds that it may have adverse effects on current or future employment.

The sensible way forward is to recognize and anticipate these difficulties. Upgrading the technological apparatus of public agencies is as much a problem of political economy as one of choosing the right technology. As Heeks (2002) points out, while many attempts to foster electronic government have been abject failures, there is a growing set of positive role models that can be emulated. Andhrapradesh.com, the official website of one of the poorer Indian states is an example of how e-government can begin to alter patterns of interaction between governments and citizens. NGOs may have a useful role to play here.

4.2 Communications access and infrastructure: the supply side

Many people point out that there is more fundamental requirement for participation in the information economy, namely access and connectivity. Communication networks currently connect areas of high-income concentration. Developing countries are poorly connected to global networks, and rural parts of developing countries are often not connected at all. Creating electronic channels for e-government would be futile if the vast majority cannot access these channels.

This is the issue of supply of communications infrastructure. In most countries, telecommunications networks were long run as public-sector monopolies. This may have been justifiable given the natural monopoly characteristics of these services and the belief that these services should be run in the larger public interest. In practice, of course, the public interest was poorly served. Despite the noble intentions, access to communications facilities remained partial and highly unequal. Technological developments have altered the original premise. For instance, the declining cost of mobile telephony has diminished the natural monopoly characteristic of telephony, making competitive private provision a viable alternative. In the last two decades, many countries have privatized their national telecommunications monopolies and opened their networks to competition and foreign capital. Such liberalization has typically resulted in improved provision, in terms of access and average price. Of course, as the table below shows, telecommunications still remains a public-sector monopoly in many countries.

	Market structure in telecommunications 2000		
	Number of countries		
	Monopoly	Duopoly	More than two firms
Local telephony	121	19	44
National calls	134	12	36
International calls	129	16	38
Digital cellular	47	28	79
Internet service	13	3	81

Source: UNDP (2001).

In general, governments need to reassess their objectives carefully. Where telecommunications continues to be a state monopoly, the sector tends to be a major source of revenue for the government. Fiscal difficulties make it tempting to set communications prices in order to maximize revenue than access. Even when governments have shown readiness to privatize telecommunications, the aim has often been to maximize privatization revenue or license-fee income rather than to maximize access to communications. This may be a luxury that most countries can ill-afford. From a long-term social point of view, it would be far better to create structures that maximize access without the need for major subsidies. A competitive market structure may well be compatible with this objective. Privatization is a possible first step, and if domestic competition is restrained, a pro-competitive regulatory environment may be important.

Breaking public-sector monopolies in telecommunications is not necessary for increasing access. Large countries may be able to expand their networks using domestic resources. China, for one, has greatly expanded access to its telecommunications network. Between 1990 and 1999 the number of fixed-lines rose from 6 to 86 per 1000 people, and for mobile telephony to 34 per 1000. Significantly, this growth occurred within the public sector and using domestic resources. Nor can privatization solve the problem of inequality of access, or extension of access to rural areas. Indeed, it could make those problems worse as private providers are usually exempt from universal service obligations and have patterns of pricing that are less favourable to the poorer sections. Hence each country must assess the case for and against privatization. Where governments choose to move in favour of competitive markets, the government may have a continuing role in subsidizing access to deprived groups, or mandating it through regulatory means.

There is considerable scope of innovative solutions in the private sector. Even in the poorest countries, people are often prepared to pay for access to communications. Whether there are clear and immediate benefits to users, they are prepared to invest in equipment. For instance, ownership of televisions is relatively widespread in India. While penetration of telephone lines is low, the shared use of existing lines through phone booths extends access. As one would expect, the emergence of cyber-cafes has provided shared access to the Internet in large metropolitan areas.

Often small communities can pool resources or use innovative schemes to gain shared access to expensive services. Bangladesh—one of the poorest countries in the world—provides a striking example. GrameenPhone is a private scheme that provides mobile telephony in rural areas through shared access. Mobile phone handsets are made available on credit-financed franchises to individuals (typically women). They raise revenue by re-selling telephony services to the local community. The shared use economizes on a precious resource and enables the provision of primary communications to rural communities. Revenue per shared rural line is often higher than average for an urban connection, so these micro-connectivity schemes do not rely on external funding or subsidy. New technology may increase the scope for such private ventures by reducing the costs of creating physical and virtual networks.[10] The government can encourage these trends in various ways. In some developing countries, the state needs to provide the basic infrastructure to make these private-sector initiatives

[10] ITU (2000) discusses the feasibility of various communications technologies in rural areas.

viable. Some public investment in infrastructure and primary communications may be desirable.

Of course, when it comes to access to the Internet, physical connectivity is not sufficient. As Nanthikesan (2000) points out, access is also constrained by high cost, inappropriateness of content (e.g., lack of local language content) and lack of familiarity with the medium. Often, intermediaries arise to provide indirect access to those who lack the skill and training to use computers: in many small cities in India, it is possible to dictate messages that are then delivered using a combination of email and conventional delivery, all for a relatively low charge. Local innovation in the creation of low-cost hardware, such as the fledgling Simputer project in India, may help overcome high hardware costs.

Some have argued that governments should go further than investment in infrastructure and primary communications. Should the government subsidize the purchase of computers and other end-users' hardware? There may be case for subsidizing institutional access—in schools, universities and medical institutions, for instance—but in general the case for subsidies is not very persuasive. First, the practical reality is that even well-intentioned subsidies are often misappropriated. Second, for the vast majority of people in the developing countries, access to the Internet is *not* a priority. The margins of subsistence are defined by access to water, food, health and literacy—as yet, the Internet does not deliver these directly. The dangerous possibility is that enthusiasm about the Internet could divert resource from meeting more basic needs. Lastly, as the GrameenPhone example suggests, individuals and informal markets invent innovative ways of sharing the use of expensive equipment. Internet cafes and kiosks will arise as people come to value them.

4.3 Global opportunities and risks

How can developing countries take advantage of the globalization spawned by the new economy? One possibility, for some developing countries, is to specialize in the production of knowledge goods. India has benefited from its large reasonably skilled and English-speaking workforce. Arora and Athreye (2001) point out that India's emerging software industry has boosted exports, and at the same time provided a good exemplar of entrepreneurship and corporate governance to other sectors of the economy. Many privately run 'teaching institutes have sprung up to provide the specific IT-skills needed for this sector'. However, as Chandrasekhar (2001) points out, the largely unregulated nature of private IT-related education poses potential problems. The lack of clear standards of technical achievement has undermined the perceived quality of IT-training in India. While this is not a major impediment in early stages of product cycles, when Indian software firms are involved in relatively low-value aspects of routine programming, the lack of advanced skills may make it harder for Indian firms to migrate to the more profitable areas of software design and development. Indeed, the largest Indian software firms are acutely aware of this risk and have created their own 'universities' to address the problem. But the inability of individual firms to appropriate the benefits of investment in human capital may result in chronic under-investment. The government may have a role to play though some amount of regulation and continued investment in education.

The Internet has also made it possible for developing countries to compete in the global market for ICT-enabled services. These range from back-office processing, medical transcription, and other services performed for firms in the developed world. Low-cost telecommunications have resulted in call centres to process routine customer queries for large corporations. Once again, the presence of a large English-speaking workforce has proven to be a crucial advantage.

It is inevitable that, over time, the Internet will become a major channel of transacting international trade. Large global corporations are increasingly switching to Internet-only supply chains and electronic exchanges will soon come to dominate commodity markets. To retain access to these trade channels, business enterprises in developing countries will have to adopt this new medium. Large firms in developing countries such as China have already made considerable progress in using the Internet for developing their exports.

In the developed world the Internet has been associated with spectacular growth of electronic commerce. Even as the end of the dot.com boom has led to a more realistic assessment of the potential of e-commerce, the question remains, how, and to what extent, can developing countries benefit from e-commerce? Most developing countries do not currently have the financial structure (e.g. the widespread use of credit cards) and delivery networks to support growth of domestic electronic commerce. It is futile to replicate patterns of e-commerce: this will only take up precious resources without much success. Besides, the winner-take-all characteristic of the new economy suggests that copying the successful countries will not always work. You may close the digital gap, but as long as there is a gap, rich countries may capture most of the benefits.

Instead, it is better for developing countries to identify their own problems and ask if new ICT can solve them. Instead of conventional forms of e-commerce, countries can use new technologies to improve the functioning of conventional markets. For instance, if labour markets work imperfectly, electronic labour exchanges could help match employers with the right employees. If commodity markets don’t work well, electronic clearing-houses can reduce inefficiencies. Information networks may prove valuable in improving routine communications, reducing inventory costs, and in planning and design of supply chains. There are many potential uses in the areas of telemedicine, distance learning, and agricultural improvement.

There is also a case for closer cooperation amongst the developing countries. First, the new economy will affect developing countries very differently from its impact on the developed world, and there is much that they can learn from each other. Second, small countries lack the resources to build their own information economy and to take advantage of economies of scale. Coordination can improve the return on their collective investment. In the past coordination required geographic proximity, so collaboration naturally led to regional groupings of countries. The information economy alters the notion of distance: instead of geographic distance, what matters is how close societies are in terms of their level of development (say, GDP per capita), educational achievements, etc. Modern grouping will be based on shared needs as delineated by these criteria. The grouping of Small Islands Developing States is an example of such an alliance.

6 Conclusion

It is undeniable that in order to participate in the new economy, developing countries must invest in communications infrastructure. However, this may not be enough. In the absence of domestic demand for information goods and services, the new economy will have little relevance to the vast majority of people in developing countries. The government and other public agencies can play a useful role in boosting demand. For instance, the introduction of information technology within government departments is a means of generating critical mass for participation in the new economy.

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