Introduction

Few subjects currently attract more attention in international policy-making circles than the global digital divide, that is the starkly differential extent to which various forms of information technology (IT) (especially the Internet) are benefiting rich as opposed to poor countries. Although it is often treated as an entirely new and unique aspect of the relationship between rich and poor countries, we are of the opinion that the digital divide should be seen rather as a continuation of the same underlying forces that create what Singer has referred to as ‘international technological dualism’ (Singer, 1970). By this he meant, first and foremost, a heavy concentration of global research and development (R&D) in the rich countries, a percentage that even now amounts to some 96 per cent of the world total. Even so acute a degree of inequality would, however, be unimportant if, as he put it at the time:

the direction of advance, the scientific and technological priorities and the methods of solving scientific and technological problems, were independent of where the work is carried on. This, however, is patently not the case, the [then] 98 per cent of research and development expenditures in the richer countries are spent on solving the problems which concern the richer countries, according to their own priorities, and on solving these problems by the methods and approaches appropriate to the factor endowment of the richer countries. In both respects - selection of problems and methods of solving them - the interests of the poorer countries would be bound to point in completely new directions (ibid., p. 62).

As discussed in Chapter 2, moreover, even such R&D as takes place in the developing countries is often influenced by and imitative of what occurs in the rich countries (or, what often amounts to the same thing, scientists from the former countries migrate to the latter as part of the international ‘brain drain’). Looked at from the point of view of these defining characteristics of ‘international technological dualism’, the global digital divide more accurately reflects yet another technological gap, rather than an entirely new aspect of the relationship between rich and poor countries. After all, as noted in Chapter 2, R&D in information and communication technology (ICT) based industry remains overwhelmingly concentrated in the developed world; what research is conducted in developing countries is often influenced by the needs of multinational corporations and the brain drain has probably accelerated in
recent years, especially in areas such as software (see Chapter 2 for details of this argument).

The global digital divide reflects itself, furthermore, in a divide within the developing countries themselves, just as ‘international technological dualism’ tends to manifest itself in an ‘internal technological dualism’.

Most obviously, since virtually no research and development expenditure is devoted to problems of special concern to the under-developed countries, we find that technology tends to be much more up to date in those sectors … in which the activities in the poorer countries are most similar to those in the richer countries … . This will be obviated only by deliberate countervailing international action … . Barring such special efforts – at present on a minute scale – the end result will be that agriculture, rural, small-scale production as well as production utilizing indigenous materials and local labour, will be technologically neglected and backward (ibid., p. 65).

Thus described, internal technological dualism in ICTs closely corresponds to the situation created by imported technology in general (Stewart, 1977) and may, indeed, even be more pronounced as new technology becomes more complex and science-based. In India, for example, about 25 per cent of all telephones are located in four metropolitan cities. And “even though 74 percent of the population lives in rural areas, the number of village telephones is less than a few percent. The total number of Internet subscribers amounts to barely 1 per 10,000 population, mostly confined to the large cities” (Jhunjhunwala et al., 1998). Similar figures could readily be cited for other developing countries as well.

Even from the brief review provided above, it is clear that the literature on technology and development has studied the global R&D system and its implications in quite some detail and over a relatively long period of time (see especially the afore-mentioned reference to the work of Stewart, 1977). Yet, as shown in the next chapter, these important issues are almost entirely ignored in the theory of economic growth, which tends to embody highly abstract notions about the nature of technical change and its diffusion in the world economy. It is often assumed, for example, that such change is exogenous, accessible to all countries or superior (in terms of economic efficiency) to all existing technology (and would thus be rapidly adopted by all countries, rich and poor). Partly on account of assumptions such as these, many conventional growth models predict a convergence rather than a divergence in income levels between rich and poor countries.

Only relatively recently has formal growth theory begun to incorporate more realistic assumptions about the pattern and nature of global research (assumptions that in key respects overlap with the concept of international technological dualism) and (in consequence) about the patterns of global inequality. Most notably, a model developed by Zeira (1998) assumes that
innovations generated in countries with high productivity (and thus high average incomes) will tend to be adopted primarily in similar countries (with a similar endowment of capital and labour). In effect, labour-saving innovations are consistent with and adopted primarily by rich rather than poor countries. With biased technical change of this kind, the model is thus able to explain the large and growing international differences in per capita income that are strongly suggested by the empirical evidence (as opposed to the convergence in the distribution of incomes across countries that is predicted by conventional growth theory).

BRIDGING THE DIGITAL DIVIDE

The first part of the book is useful, not least because it suggests that overcoming the global (and also the internal) digital divide will require purposive countervailing action to develop and identify ICTs other than those typically generated by the global research system (which, as noted in both Chapters 1 and 2, tends, if left to itself, to produce solutions to developed rather than developing country problems). The second part of the book, accordingly, concentrates on discussing the key elements of such policy action in the light, partly, of the relevant examples that already exist.

In focusing on the technological dimension of the issue, we in no way wish to convey the impression that other policy areas (such as pricing policy, liberalization of the telecommunications sector or the reform of public administration at various levels) are unimportant. However, in addition to the fact that many of these other areas have already been more systematically treated elsewhere, our justification of the technological emphasis of the book also rests on the view that technological changes in favour of, rather than biased against, the poor are prerequisites for spreading ICTs relatively widely across both the urban and rural sectors in developing countries. Even in their own right, moreover, the technological aspects of bridging the digital divide encompass a wide range of literature, including as they do not only telecommunications and basic telephony but also computer hardware and software, e-mail and access to the Internet. Indeed, the chapters in the second part of the book reflect this diversity, with some of them focusing on just one or two of these various forms of IT, while others are broader in scope dealing, in some cases, with all the categories that have just been mentioned.

Whichever form of IT we happen to be concerned with, however, policies aimed at bridging the digital divide between and within countries need to be based on the recognition that – for most of the population – the goal should be one of providing universal access to, rather than individual ownership of, the
technology in question. The point here is simply that individual incomes in most developing countries, and especially the remote, rural areas of those countries, are usually too low to represent an effective demand for ITs (as opposed to developed countries where incomes are mostly high enough to make individual ownership a realistic goal).

As a result, developing countries have begun to articulate transitional goals more in tune with local economic, demographic, social and geographic circumstances. Underlying the various policy approaches is a common notion of universal access. The concept is that a telephone should be within a reasonable distance for everyone. The distance depends upon the coverage of the telephone network, the geography of the country, the density of the population and the spread of habitations in the urban or rural environment. This diversity has been reflected in a range of innovative policies and platforms: from the use of public telephones to entrepreneurial teleshops to community telecentres. (International Telecommunications Union (ITU), 1998, p. 10). Italics in original.

The relevant policy question from our point of view then becomes one of generating or identifying forms of IT that contribute to the achievement of universal access in developing countries. And while we do not wish to list each and every possible solution to this question, we do provide in Table 0.1 an illustrative selection of some of the most interesting and promising examples that are described in the text.

It is worth noting that the examples cited in Table 0.1 promote rural access through rather different (though not necessarily mutually exclusive) mechanisms. In some cases, for example, as with certain low-cost computers or local wireless local loop (WLL) systems of communications, the technologies are designed specifically for developing rather than developed country income levels and other socio-economic conditions. In other cases, the reductions in costs arise rather from the extended use of ITs in existing institutions (as occurs, for instance, with the use of computers outside of school hours by the local community, or the use of post offices to transmit e-mail messages). In yet other cases, universal access is made more attractive by adding elements of individual ownership to technologies meant for communal use (as when wireless pay-phones offer incoming call facilities). A fourth type of mechanism arises when new technologies are used as a substitute for a basic telecommunications infrastructure, which simply does not exist in certain parts of most developing countries (we are referring here, for example, to the case of the Grameen village pay-phone concept in rural Bangladesh, which uses mobile phones instead of fixed-line connections). Finally, and perhaps most importantly, we need to recognize that:

Telecentres in the developing world have, thus far, been primarily sponsored and undertaken by governments, multilateral institutions, and nonprofits. Because of
the desire to create what is essentially a public good (access to information and communications services), only secondary attention has been paid to entrepreneurism and sustainable business (Best and Maclay, 2001, p. 77).

For this reason, the case study of Internet kiosks in India is especially important as a potential model of sustainable access in developing countries (see Chapter 7), relying as it does on private entrepreneurship rather than grants of one kind or another.

It is also worth noting that descriptions of and information about the technologies listed in Table 0.1, as well as other examples mentioned in the second part of the book, are not at all easily found in the literature, even with the aid of the Internet. On the contrary, we have to search an enormously diverse range of sources and the process is extremely cumbersome for policymakers of various kinds, national as well as international. As explained in Chapter 8, there are numerous reasons why the relevant information is so fragmented and difficult to retrieve. And while we do not intend to repeat those explanations again here, we do wish to emphasize the need for a single (dedicated) online registry of information related to ICTs that could help developing countries to promote universal access and lessen the global digital divide (as well as, of course, the divide within the developing countries themselves).

To what extent such information will actually be used, however, depends (as noted in Chapter 8) on a variety of factors, not the least important of which is the political opposition likely to be exerted by those seeking to promote alternative, more conventional technologies (we are thinking here not only of large, multinational firms but also national ministries and institutes, which often tend to favour imported, modern alternatives). Opposition of this kind was shown to exist in a number of actual cases described in the text, but what might be termed the political economy of bridging the digital divide is a subject worthy of far more research, theoretical as well as empirical. At the conclusion of his study of the Grameen Village Phone project in Bangladesh, Burr (2000), for example, goes so far as to suggest that the most important lesson for donors is the need to assess the political situation:

Specifically the willingness of the governmental organizations that control the fixed line grid to allow access to private mobile phone systems/operators. And the most important role donors can conceivably play, aside from investor, is political advocate, lobbying the relevant government regulators to ensure as fair, free and pro-private ICT industry as possible (ibid., 2000).

Also worthy of further research is the emerging scientific capability of certain large developing countries, such as India, Brazil and China, to design
and produce ICTs that in many respects are far more appropriate to developing countries than similar products made in the industrialized countries. Although we cited several such cases, in the areas of computers and telecommunications, it is still too early to assess the success of some of those indigenous innovations. It is also unclear what will determine the direction of future innovations, not only in ICT but also in other technologies, where advanced innovation capabilities exist in the countries concerned.

Table 0.1 Promoting universal access to IT: selected examples

<table>
<thead>
<tr>
<th>Type of IT</th>
<th>Mechanism of influence</th>
<th>Nature of institution</th>
<th>Country examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Telephony</td>
<td>Wireless telephones with incoming call facility</td>
<td>Pay-phones</td>
<td>Tanzania</td>
</tr>
<tr>
<td>Telephony</td>
<td>Grameen village cell phones project</td>
<td>Cellular pay phones</td>
<td>Bangladesh</td>
</tr>
<tr>
<td>e-mail</td>
<td>Written messages converted to e-mail and delivered by courier to destination</td>
<td>Post office</td>
<td>India</td>
</tr>
<tr>
<td>Software</td>
<td>Use of open-source (free) software</td>
<td>Schools</td>
<td>Mexico</td>
</tr>
<tr>
<td>Telecommunications</td>
<td>Low-cost indigenous wireless local loop (WLL)</td>
<td>Kiosks</td>
<td>India</td>
</tr>
<tr>
<td>Computer</td>
<td>Use of schools outside of class hours by village community</td>
<td>Community groups</td>
<td>Uganda</td>
</tr>
<tr>
<td>Computer</td>
<td>Cheap indigenous computer with smart card for individual access</td>
<td>Schools, telecentres</td>
<td>India</td>
</tr>
<tr>
<td>Computer</td>
<td>Use of (donated) older vintages (eg. 486s)</td>
<td>Telecentres</td>
<td>Uganda</td>
</tr>
<tr>
<td>Internet</td>
<td>Network computers lower cost compared to ordinary PC</td>
<td>Telecentres</td>
<td></td>
</tr>
<tr>
<td>Internet</td>
<td>Use of local Internet models using small and informal sector enterprises to provide service</td>
<td>Internet kiosks</td>
<td>India</td>
</tr>
</tbody>
</table>
NOTES

2. See Chapter 2.
3. Some of the underlying mechanisms are discussed, with supporting data, in Graham (2002). A report prepared for the World Bank analyses intra-country inequalities from the point of view of incomes, education, region, race, gender and age (World Bank, 2000).
4. In the last case, one technology is more profitable than others at all factor price ratios. Technically, it is said to dominate other technologies.
5. See, for example, Pritchett (1995).
6. We are assuming here implicitly that the adoption of IT does in fact improve the rate of economic growth. In this connection, Grace et al. (2001) conclude that ‘Theory, anecdote and available empirical evidence do suggest that ICTs have an impact on economic growth and that ‘there is mounting anecdotal and some more formal evidence that access to ICTs amongst the poor and in rural areas increases incomes’.
7. Much of the work in these areas has been done by the World Bank, the IDRC and the ITU.
8. This was the major theme of the World Telecommunication Development Report of the ITU (1998).
9. An African country recipient of Dutch aid is reported to have chosen fewer Pentium computers over a substantially larger number of computers with 486 processors. Personal communication from Mike Jensen, 30 January 2001.
10. In the early literature on the problems confronting ‘appropriate technology’, political economy factors were treated, among other authors, by Stewart (1987) and James (1996). There is also a need to facilitate the export of appropriate innovations from countries such as India and Brazil to the many other developing countries lacking advanced technological capabilities of this kind.

BIBLIOGRAPHY

Jensen, M., Personal communication, 30 January.
Bridging the global digital divide