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# ICTs

## Information and Communication Technologies for the Poor

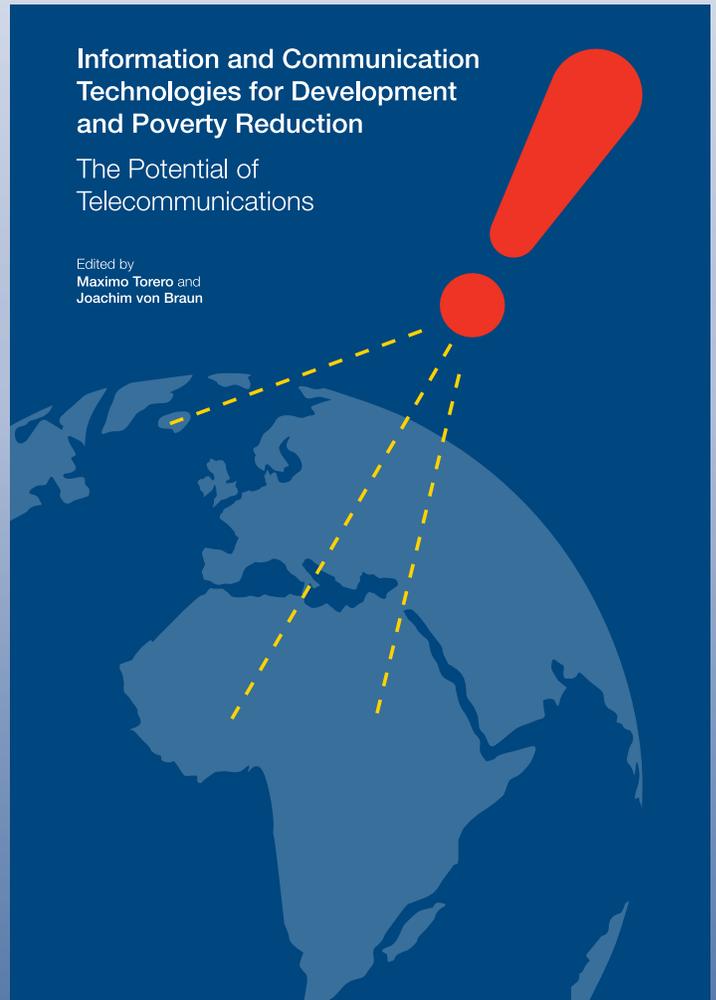
Maximo Torero and Joachim von Braun

**W**e live in the age of information. The development and proliferation of electronically communicated information has accelerated economic and social change across all areas of human activity worldwide—and it continues to do so at a rapid pace. While the use of information and communication technologies (ICTs) remains concentrated largely in the developed world, ICT diffusion is beginning to reach developing countries, including poor

Information and Communication  
Technologies for Development  
and Poverty Reduction

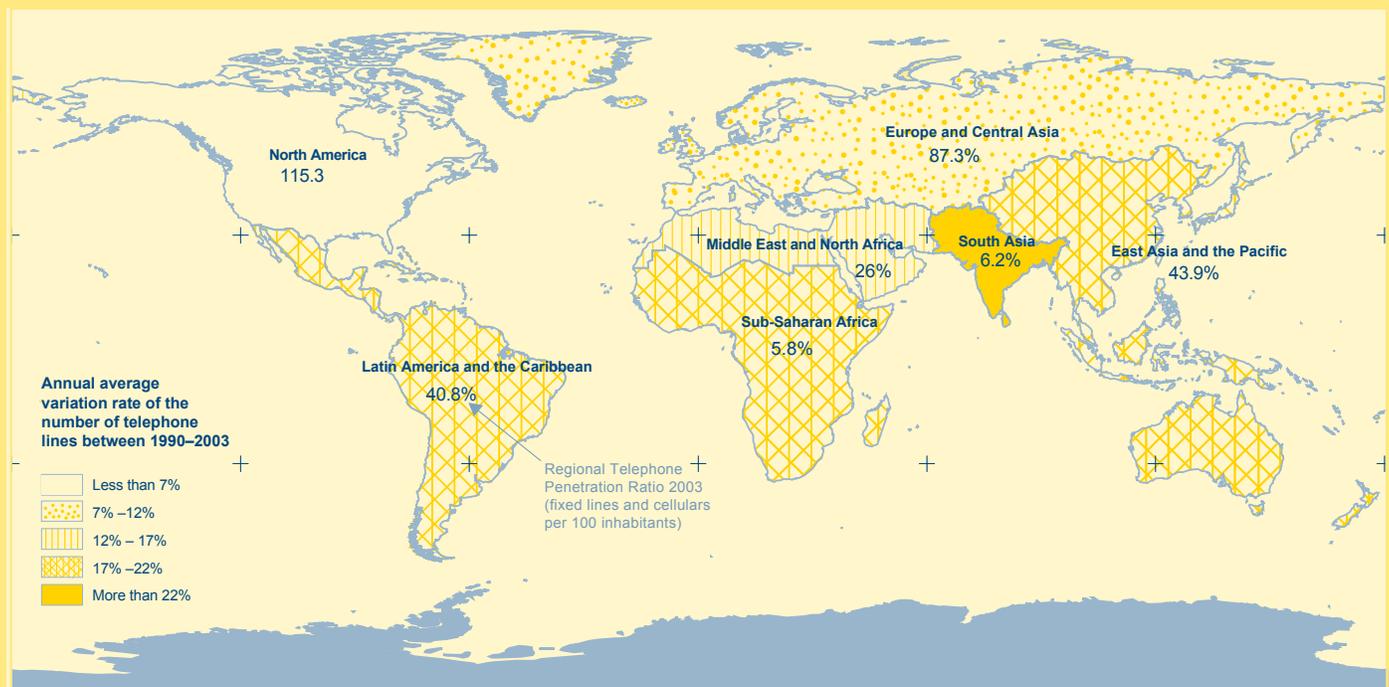
The Potential of  
Telecommunications

Edited by  
Maximo Torero and  
Joachim von Braun



rural areas, bringing with it high hopes of positive development outcomes. Yet although technological innovations, such as cellular telephones and wireless broadband access, are playing an important role in building ICT levels globally, strong inequality still remains. The rapid growth of ICTs in developing countries is partly a result of very low initial access, and therefore in absolute terms developing countries are still well behind the developed world in access to ICTs. As Figure I shows, total telephone access in South Asia and Sub-Saharan Africa grew by an average of 22 and 17 percent per year, respectively, from 1990 to 2003, but their current levels of access are still just 6.2 and 5.8 percent. Inequality of access is even greater within developing countries, especially between urban and rural areas, where the digital divide continues to widen.

**FIGURE I—Annual Average Variation Rate of the Number of Telephone Lines (fixed and cellular), 1990-2003, and Current Levels of Penetration**



Sources: International Telecommunication Union, World Telecommunication Indicators Database (Geneva, 2004); and authors' own elaboration.

Why are ICTs assigned such importance in the development context? ICTs are unique in having an impact beyond the individual user's welfare. ICT infrastructure offers economies of scale that stimulate network building and consequent spillover benefits. ICTs enable interactive communication unhindered by distance, volume, medium, or time. They promote greater inclusion of individuals within networks and, even more important, increase the diversity of participants by overcoming the barriers of physical distance and social standing. The immediacy and reach of ICTs also promote faster, more efficient, and ultimately better decisionmaking across all fields of endeavor. Figure 2 tries to conceptualize how the driving forces behind ICT adoption translate into economic and social benefits.

Some commentators, however, hold much more skeptical views of the benefits of ICTs for development. They argue that access to ICTs largely depends on education, income, and wealth and that the so-called digital divide is only a part of a much broader development divide. Limited education, inappropriate language skills, or lack of resources could prevent disadvantaged segments of the population from accessing ICTs, ultimately exacerbating information gaps and increasing income inequality between and within countries. The income gap could be further widened if ICT use raises the demand for skilled labor and—by its introduction into manufacturing and service industries—reduces the demand for unskilled labor, at least in the short term. It is often argued that developing countries have other, more pressing investment priorities, such as food, safe water, education, and public health, and that devoting limited resources to ICTs must be justified on the basis of its opportunity costs relative to other development agendas.

The variety of views about ICTs reveals that their role in development is unclear, especially without convincing evidence of their impact—and little research has been conducted on the direct and indirect links between ICTs and poverty reduction. A new book, *Information and Communication Technologies for Development and Poverty Reduction: The Potential of Telecommunications*, published by the Johns Hopkins University Press for IFPRI, addresses several pressing questions surrounding ICTs. How do ICTs affect economic development in low-income countries? How do they affect poor people in these countries and in rural areas in particular? What policies and programs facilitate their potential to enhance development and the inclusion of poor constituents?

## FIVE QUESTIONS

The book presents researchers' findings related to five critical questions.

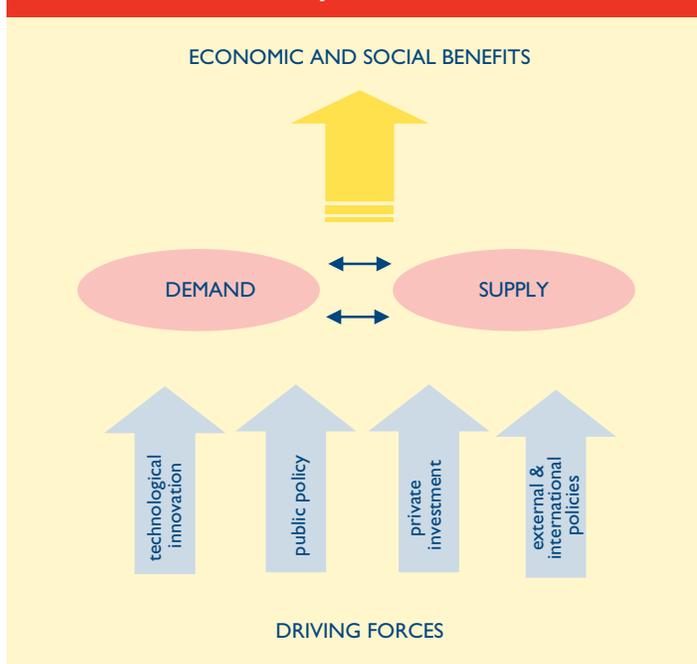
### 1. What link exists between ICT growth and economic growth?

In assessing the potential for ICTs to promote economic growth that benefits the poor, two central questions remain to be answered: First, has a causal relationship between ICTs and economic growth definitely been established, or are other factors involved? Second, is the resulting growth pro-poor, and, if not, what conditions could make it so?

Estimates for 113 countries over a 20-year period show a positive link between telecommunications infrastructure and income, as well as between telecommunications infrastructure and gross domestic product (GDP). The estimates suggest that a 1 percent increase in the telecommunications penetration rate might be expected to lead to a 0.03 percent increase in GDP. At the same time, models for different country groups reveal that telecommunications infrastructure has a nonlinear effect on economic output, particularly for lower and higher middle-income countries. These results imply that telecommunications networks need to reach a critical mass to have a discernible impact on economic output. In particular, growth effects were found to be strongest in areas with telecommunications penetration rates of 5–15 percent. Above and below this threshold, growth effects were limited. Given that the average telecommunications penetration rate in low-income countries is very low, significant network investment and expansion are needed before ICTs can begin to affect growth. Marginal improvements in telecommunications infrastructure are unlikely to yield any discernible growth effects.

This point is crucial. The benefits of networking are critical to the concept of ICT-induced growth, and if

**FIGURE 2— ICTs and Development: A Conceptual Base**



the minimum critical mass is not achieved, the network externalities required to benefit users will not materialize. By their very nature, ICTs have the potential to quickly reduce the digital divide among countries and regions. Across countries where levels of inequality differ, “leapfrogging”—fast-track access to new ICTs—sometimes occurs, but sometimes does not. ICTs and their associated benefits are not yet reaching poor countries, and especially poor rural areas within countries. These different outcomes are largely determined by public action and by institutional arrangements for regulation and effective privatization. In addition, technologies and service provision are concentrated in developed countries, raising concerns about whether appropriate technologies are being provided at affordable cost in developing countries.

## **2. Do weak institutions block effective use of ICTs?**

Research shows that ICTs cannot be developed without strong institutions that overtly facilitate private investment. Many of the national telecommunications monopolies in developing countries were privatized in the 1980s and 1990s, introducing them to competition. This stimulus, combined with ongoing technological change, prompted the constant development of new services in some developing countries, especially the exponential increase of cellular telephone penetration in poor countries. But this increase has not occurred in all countries; in some, the stimulus is taking effect slowly, erratically, and with uncertainty. For example, in some countries (such as Argentina, Chile, Mozambique, Peru, Senegal, and Uganda), the government is facilitating rapid ICT progress with the help of nongovernmental organizations (NGOs) and the private sector. In others (such as Cameroon, Congo, Ethiopia, North Korea, and Zimbabwe), the government stands in the way of reform. Within countries, the inequality is even greater. The lesson for reducing unequal access seems clear: governments need to differentiate market efficiency gaps from true access gaps (effectively, missing markets) and then respond with the appropriate set of interventions for each case.

With a market efficiency gap, a difference exists between what markets are achieving under current conditions and what they could achieve if they functioned well. To correct this kind of gap, the government must focus on establishing market-oriented policies and regulations that create a level playing field for the private sector and new entrants. The only questions relate to how far the market can reach commercially and how best to implement more competitive conditions and in what order. Strong, autonomous, and capable regulatory agencies are needed to (1) assure market competition and freedom of business/technical choice, (2) provide attractive licenses designed to encourage growth, (3) apply the minimum of regulations

necessary, and (4) in particular, promote cost-effective access charges for new entrants. These types of regulatory institutions are hard to build, especially because local expertise in the area is lacking. Professionals need to be trained in every aspect.

With a true access gap, on the other hand, public intervention in ICT provision is still required for some areas and population groups that would not be served, even under the most optimal, efficient, and liberalized market conditions. Certain people and locations invariably lie beyond market limits. In such cases, the government may need to induce service provision through, for example, incentives like subsidies involving public–private (or NGO) partnerships. What is the best way to implement subsidies to maximize scale economies and production, consumption, and network externalities, while achieving sustainability? There are three main conditions: (1) bottom-up identification of demand and consumer willingness-to-pay, (2) recognition of the importance of market competition in allocating subsidies, and (3) a clear, stable, and credible legal and regulatory environment.

## **3. Have ICTs been adapted to low-income countries, and have they had an impact on SMEs?**

Collectively, small and medium-sized enterprises (SMEs) are perceived as an engine of growth in developing countries, but they face a formidable task—surviving and competing in a global market. As one of the driving forces of globalization, ICTs may deliver unprecedented opportunities.

SME case studies provide substantial evidence of increased ICT adoption in low-income countries and positive ICT effects on SME performance. Wide use of the available technologies shows that ICT adoption can be a key element in remaining competitive (see Box 1). Nevertheless, the impact on firm performance in most cases is small. Given that SMEs in the case countries have used ICTs for a relatively short time, time lags may be a factor. Low penetration rates in developing countries, below the reported minimum threshold level, may also be responsible. In addition, and perhaps more important, the lack of complementary infrastructure may reduce the opportunities for firms adopting ICTs to perform better. The concentration on quantitative performance indicators may also have omitted notable improvement in the qualitative performance of the firms.

More data need to be collected over longer time periods. Such data—especially those collected from the same subjects—should focus on SMEs and on eliminating any doubt about a causal relationship between the diffusion of ICTs and economic and social benefits in developing countries and regions. Our results confirm a positive correlation, in some cases quite strongly, between ICT access and improved SME performance.

### **BOX 1—The Indian Garment Industry and the Impact of ICTs on Export Performance**

The relationship between intense ICT use and export performance, as an Indian case study shows, illustrates the global trend toward a changing value chain, especially in terms of the supply chain of developing-country producers. The use of ICTs in design and marketing activities increased the competitiveness of the Indian garment industry, even for small enterprises. The Indian garment industry sheds light on possible opportunities to advance labor-intensive industries through the use of ICTs, enabling them to remain competitive in international markets while continuing to offer significant job opportunities. This finding is relevant in view of impending changes to the international trade regime that will eliminate the preferred status of developing countries in the world export market.

#### **4. Does household access to ICTs remain constrained?**

The reduction of the information gap at a low cost is of central importance for the poor. Even though access is still very restricted in rural areas, it is fair to say that ICTs have an important positive impact on rural households (see Box 2). The welfare effect of telephone use in rural households is verified by users' perceptions of the benefits, the high demand for service, the substantial consumer surplus associated with telephone use, households' willingness to pay, and results from econometric analysis. It is possible to increase that positive impact by making ICTs more accessible in rural areas, adapting new technologies to rural settings, and using old technologies in innovative ways, such as providing information services by telephone.

In both SMEs and households some policy problems remain, however. First, most case studies reveal that major regulatory impediments lead to lack of private-sector participation in telecommunications, and consequently to insufficient competition. As a result, access costs are too high, interconnection between networks is problematic, and infrastructure cannot be shared among operators. Second, a number of potential barriers to the effectiveness of ICTs remain. Apart from issues of access and price, barriers to ICT effectiveness fall into three principal categories: barriers involving skill levels, such as in accessing Internet information; barriers involving ICT use for development-related purposes; and barriers related to content relevance. These factors have the potential to influence the

rate of adoption and the degree to which available Internet information reaches individuals in the community. Given these barriers, expanding ICTs in rural areas may require complementary measures, such as computer and Internet skills training, web pages designed to direct users to locally relevant content, or access that targets specific groups, such as youth, who may experience fewer sociocultural barriers to ICT use. In many low-income countries, access to telephones is the basis of pro-poor ICT growth because specialized skills are not needed and because telephone access forms a platform for more advanced ICT adoption.

Finally, with respect to cost barriers, it will be important to learn from existing models. Public Internet access, for example, provides efficient, low-cost access to multiple users, at both the SME and household levels. This business model could be modified to suit a dual broadband strategy, promoting both the deployment of wireless broadband networks and the adoption of voice telephony applications targeted to low-income users.

#### **5. Can ICTs play a role in providing pro-poor public goods and services?**

ICTs can be a powerful tool for improving the quality and efficiency of government services, such as health and education, although a clear gap still exists in the use of ICTs

### **BOX 2—Welfare Gains with Local Calls in Rural Areas of Bangladesh, Laos, and Peru**

Analysis of households' demand for local telephone calls in rural areas of Bangladesh and Peru and estimates of the gains in welfare from using local telephone calls compared with alternative means of communication (mail, traveling, radio communication, and other means) show interesting results. In both cases, a considerable gap was found between current prices of alternative means and local telephone use. This gap can be used as an approximation of households' willingness to pay to have telephone access. Just within the poorest quintile, the minimum estimated gains in welfare from local telephone calls compared with regular mail were US\$0.11 and US\$1.62 for Bangladesh and Peru, respectively. In Laos a comparison of households that were similar in all characteristics with the exception of access to phones showed that telephone access resulted in an increase of 22 percent in per capita total consumption and 24 percent in per capita cash-based consumption.

for the delivery of public goods. Cross-country analysis indicates that telecommunications investment may well be associated with improved health status. A simple, linear cross-country regression of the growth rate of fixed phone lines explains about 11 percent of the growth rate variance for life expectancy. (This result is validated with more sophisticated regression analysis.) Prominent applications for health include the creation of “telemedicine” centers that offer medical advice or health information to rural inhabitants via email or the Internet. ICTs have also been used to design global telecommunications networks that link health care workers around the world via email. Additionally ICTs have been used for educational purposes, such as the African Virtual University and the use of the Internet to disseminate information on farming technologies and changing prices to 30,000 villages across six states in India.

These cases, however, are isolated at this stage. Poor people are still excluded from many public services, and ICTs have not been adapted to the appropriate delivery of pro-poor public goods in general. The need remains for innovative ways to provide access to public services using ICTs. The strong link perceived to exist between ICT attributes and the Millennium Development Goals (MDGs) reflects this reality. Successfully harnessing the power of ICTs could make a substantial contribution to achieving the MDGs, both directly through the delivery of public services and indirectly through the creation of new economic opportunities.

## CONCLUSION

ICTs offer an opportunity for development, but not a panacea. For the potential benefits of ICTs to be realized in developing countries, many prerequisites need to be put in place: prompt deregulation, effective competition among service providers, free movement and adoption of technologies, targeted and competitive subsidies to reduce the access gap, and institutional arrangements to increase the use of ICTs in the provision of public goods. Given the diverse potential benefits of ICTs, especially in the provision of public goods, subsidies traditionally used for poverty alleviation could be adapted to create incentives for the use of ICTs. For example, conditional cash transfer programs, which are largely tied to education or health, could be implemented at the community level to provide Internet access to children where educational and health services are delivered. Another example is to increase access to savings and banking services through banking cards for low-income households, as in recent experiments in India. At the same time, such programs would contribute to the necessary critical mass of ICTs.

Access to information through ICTs is a question not only of *connectivity* but also of *capability* to use the new tools and relevant *content* provided in accessible and useful forms. Connectivity has been a priority, and it is a prerequisite for the other two “Cs”. But given the speed at which technologies are evolving and can move—unconstrained by overly restrictive licenses and global patenting—costs could fall significantly, facilitating adoption. Hence, we should emphasize the need for all three “Cs” to progress in tandem.

This brief is based on the following topics and case studies from *Information and Communication Technologies for Development and Poverty Reduction: The Potential of Telecommunications*, ed. Maximo Torero and Joachim von Braun (Johns Hopkins University Press and IFPRI, 2006):

1. Institutional aspects of ICTs: Bangladesh, China, Ghana, Laos, and Peru
2. Economic effects of ICTs at firm levels: India, Kenya, Laos, and Tanzania
3. Impacts of ICTs in low-income households: Bangladesh, China, Ghana, Laos, and Peru
4. ICTs for pro-poor provision of public goods and services

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