

ICT access

Effective Information and Communication Technologies (ICT) access can significantly contribute to the success of innovative businesses: it may facilitate innovation by improving information exchange and knowledge diffusion incurred in the production of innovations, foster growth by reducing production costs and increasing productivity, and expand the market for innovative products and services. Evidence confirms the positive effects of ICT access on firm innovation and productivity performance. While the use of ICT has grown steadily over the past decade, it substantially varies across OECD countries. Better ICT access also increases competition, can facilitate access to foreign markets, help companies tap into skilled labour inputs and maximise their productivity. Public policy can influence ICT access by strengthening a competitive environment that encourages the deployment of broadband across and within countries, supporting investment in next generation, high-capacity broadband networks, developing ICT skills, ensuring the open, free, decentralized and dynamic nature of the Internet, and ensuring security and privacy on the Internet.

What is ICT access?

First, effective ICT access can foster **innovation** by improving information exchange and knowledge diffusion incurred in the production of innovations:

- Better ICT access can improve **information management and sharing** within and outside the company (e.g. electronic data interchange [EDI], enterprise resource planning [ERP], customer relationship management [CRM]), and facilitate **collaboration** between and with third parties, including suppliers, consumers and research organization employees (e.g. through networking sites and collaborative tools, such as electronic conferencing tools, including discussion forum and wikis). The use of participative networks can allow firms to reach out to customers and partners in order to orient their innovation efforts and improve their products. The resulting user-centric innovations typically provide a more adequate response to the heterogeneous needs of users (von Hippel, 2005). Furthermore, ICT and broadband networks can allow firms to participate in larger research networks, which may encourage them to increase their R&D activities.
- Effective ICT access can also **lower the cost to access information and knowledge**, thereby facilitating **knowledge diffusion** and the combination of various sources of knowledge, which may result in further development of innovations. For instance, ICT helps connect elements of the global knowledge infrastructure (such as scientific databanks and large-scale science projects) in ways that may amplify their utility and impact.
- ICT can also improve **access to international capital markets**.
- However, although ICT can facilitate global collaboration and knowledge diffusion, geographical proximity still matters, especially in acquiring tacit knowledge, which cannot be codified and can only be shared through interactive, face-to-face relations.

Second, better ICT access can foster the growth of innovative ventures by reducing production costs and increasing productivity.

- ICT access and broadband-enabled trade in services allow companies to get **access to less expensive inputs and services by reaching global markets**. These services create new opportunities for business efficiency. Cloud computing is one example, where firms can adopt a pay-as-you-go model for computing resources instead of making significant up-front

investments in ICT infrastructure or software. Cloud computing services can provide high-growth firms with computing resources rapidly and flexibly in response to changing needs, and allow greater scalability, which refers to the ability to handle a growing number of activities and accept increased volume without impacting the contribution margin. Cloud computing services may also offer opportunities to access computing resources at a lower cost than firms' own ICT infrastructure (OECD, 2011). It allows immediate, on-demand access to information technology resources without the need for capital expenses in hardware and software, and thus significantly decreases entry barriers. Similar examples of cost saving can be found for legal, accounting and advertising services. Broadband-enabled global sourcing may also lead to cost reduction.

- Information technologies also **reduce transaction costs** for both business-to-business and business-to-consumer transactions. ICT lowers search costs, including the time and effort spent to determine whether a good is available on a given market, its price level and the most competitive supplier.

Third, the use of the Internet can **expand the market** for innovative businesses' products and services.

- Electronic commerce platforms on the Internet can create opportunities for **transactions that would not otherwise occur or that would not be profitable in the marketplace** by aggregating demand and by allowing a more efficient matching between supply and demand.
- The Internet can **extend the geographic reach** of the market and opens the way to transactions that could not have occurred without its existence.
- The Internet provides opportunities to **develop new products and services, new processes** (e.g. new ways of delivering products and services, and new advertisement possibilities), and enables **new business models** (e.g. online advertising or pay-per-click advertising). The Internet is the foundation for numerous new industries and services that rely solely on this technology, including, for example, the emergence of the Internet-based software industry and cloud computing.

What is specific about ICTs for innovative entrepreneurship?

Overall, the potential gains from better ICT access are likely to depend on multiple characteristics within companies, such as the availability of adequate internal skills and complementary assets. On the one hand, firms of smaller size and in more remote locations can potentially gain more from ICT than other businesses, since ICT may allow them access to previously untapped markets, products, services and knowledge. On the other hand, larger businesses may have a greater potential to maximize the benefits from ICT (e.g. thanks to a stronger skills base and greater financial means that allow the implementation of organizational changes to maximize the effective use of ICT).

Evidence on the importance of ICT access to innovative businesses' success

Importance of ICT access to innovation and firm performance

Evidence shows that the use of ICT may foster **innovation** (Spiezia, 2011; Paunov and Rollo, forthcoming) and firm productivity. ICT connectivity allows for more interaction among all market players, leading to more intense information flows, creating better and faster matching processes, and resulting in a higher rate of aggregated technology growth (Forman and van Zeebroeck, 2010; Bertschek et al., 2011). Yet complementary factors (e.g. availability of adequate internal skills and complementary assets) are necessary for these gains to take place.

The empirical evidence finds **variations across countries regarding the impacts of ICT on firm performance** (Oliner and Sichel, 2000, 2002; Jorgenson, 2001; Stiroh, 2002).

The positive effect of ICT on firms' **performance also depends on the firms' characteristics**. Empirical evidence shows that ICT use can have positive effects on firm performance primarily, or only, when supported by adequate managerial capacities and when accompanied by organizational changes (Bloom and van Reenan, 2007; Bresnahan et al., 2002; Bloom et al., 2009).

Overall, although the Internet provides a wide range of opportunities regarding the improvement of business processes, many small companies still use it for basic communication only. Relatively few small companies have integrated it into a full supply chain management system. One core reason is that small companies may not have the technology and skills to maintain complex systems (OECD, 2012a).

Importance of ICT access to boost sales for innovative businesses

- **E-commerce has grown steadily** over the last 15 years. Over the previous decade, the value of e-commerce transactions has risen by approximately 7% per year on average in the United States and EU. For these economies, e-commerce accounts for around 15% of the value of total transactions (DSTI/ICCP/IE/IIS[2012]1).
- **But growth has been uneven across OECD countries**. The number of firms making purchases online in Switzerland is nearly 80%, while the percentage is lower than 10% in ten other OECD countries. Firms are also much less likely to sell online than to make purchases. New Zealand and Israel lead the OECD in the number of firms reporting sales over the Internet (~50%), while the percentage is lower than 20% in most countries. (DSTI/ICCP/IE/IIS[2012]1). The market remains highly polarized geographically, with a “digital divide” clearly evident. Differences in infrastructure and cultural factors, such as the level of trust in businesses and attitudes towards distance shopping, may play a role in this divide. Regulations related to e-commerce are also important, including those related to data protection and acceptance of payment and contracts. These give confidence both to consumers (who feel that their information is secure) and to retailers (who understand their contractual relations).
- **The composition of e-commerce has remained nearly constant** over the past ten years. E-commerce is **dominated by business-to-business (B2B) sales** that are often handled via electronic data interchanges (EDI). Roughly 90% of the value of e-commerce transactions is from B2B. The remaining 10% of transactions are typically a combination of business-to-consumer (B2C), business-to-government (B2G) and consumer-to-consumer (C2C) activity (DSTI/ICCP/IE/IIS[2012]1).
- **Smartphones and mobile apps provide a powerful new platform for e-commerce growth**, particularly for B2C transactions. New apps allow users to scan product codes, compare prices and purchase products online. New hardware developments, such as the integration of near field communication (NFC) in phones, allow users to pay for items by holding their phones to an NFC reader and confirming the sale. Smartphones are also expanding the reach of point-of-sale equipment, as credit-card readers can be attached to mobile devices to accept payments anywhere mobile data coverage is available. Social networks (and the participative web) are also increasingly used to market and sell products online in a way that is more tailored to individual users (DSTI/ICCP/IE/IIS[2012]1).

What is the evidence on ICT access and innovative businesses?

Measures of ICT access

ICT access can be measured by several indicators, such as:

- **Development of the Internet:** Measures of the development of the Internet can be grouped in three broad categories: i) measures of adoption and usage (e.g. broadband penetration rates, average time spent online), ii) economic measures (e.g. average monthly subscription rates, investments in broadband infrastructure) and iii) technical measures (e.g. number of IPv4 addresses per capita).
- **Tariffs of ICT services:** To compare tariffs of broadband services, the OECD has developed a methodology based on a survey of stand-alone broadband offers from a set of three operators per country (OECD, 2011b). One of the objectives is to provide indicators to policy makers of the effectiveness of delivering services, as inefficiencies would impede innovative entrepreneurs and market accessibility.
- **Quality of ICT services:** In 1990, the OECD defined a list of indicators for monitoring quality of service. Over time, some of these indicators have become less relevant due to changes in technology. Some regulatory authorities have begun to measure the quality of broadband connections and made tools available for users to both assess their own connections and provide aggregated data, since advertised speeds are often very different from actual speeds users may experience. At the same time, the Internet is providing new tools to monitor network performance and the experience of users.

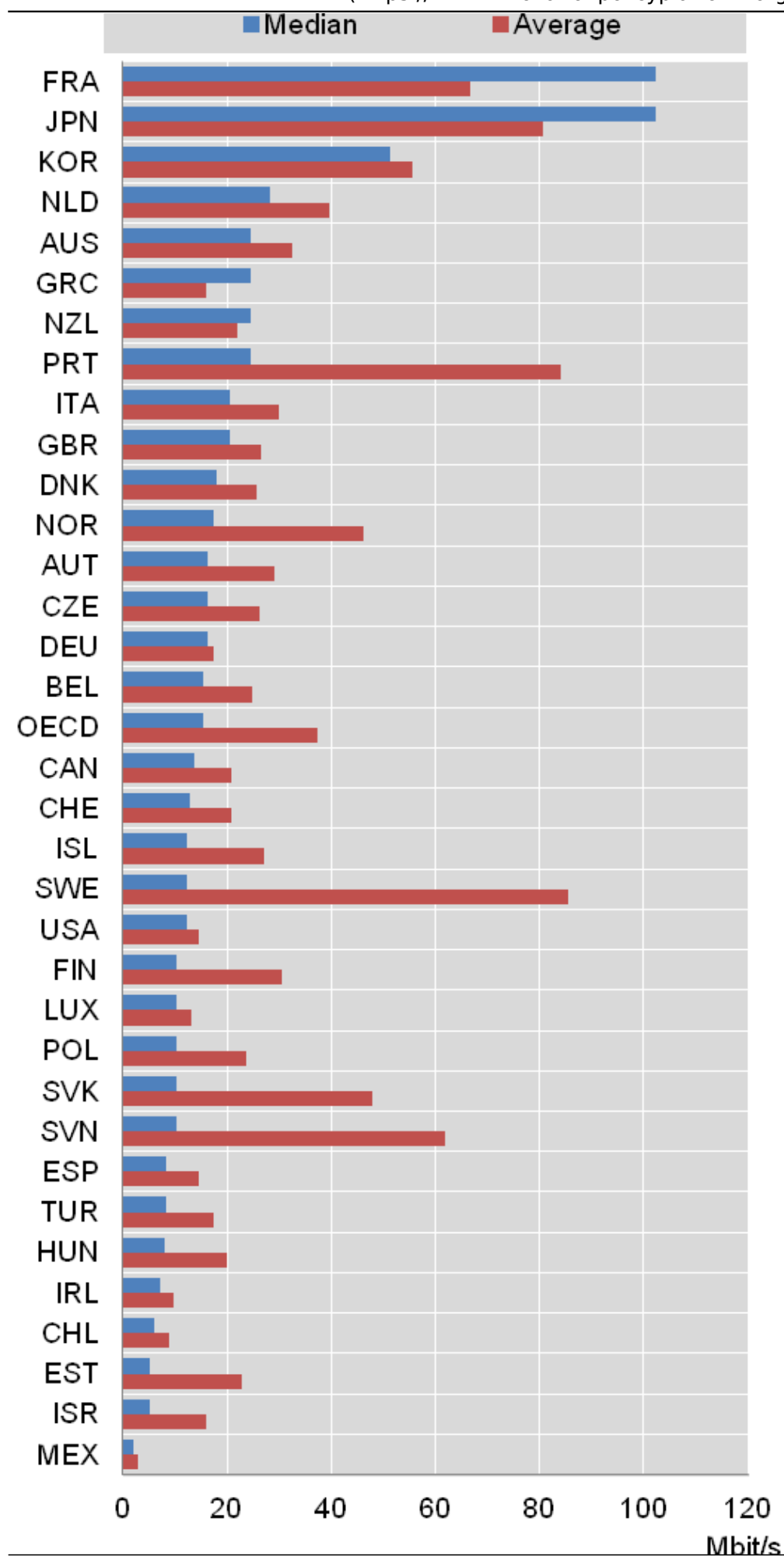
Evidences on access to broadband

There are large differences in regional broadband access within countries (Figure 1). These differences may result from multiple factors, such as geography, population density and the competitiveness of communication markets. While most firms in OECD countries have access to broadband connections (in 2010, about 88% of firms had access), penetration appears to be lower for SMEs, although small firms are still generally well connected (OECD, 2012a). However, differences are much greater in respect to the performance of networks available for firms across different countries and geographical regions in those countries, and in the prices at which these services are available.

Evidence on broadband speed and prices

Over the last decade, increased competition and the development of a range of new products have brought significant benefits to firms and consumers in the use of ICT, including falling prices, higher-quality services, a wider choice of service providers and access to new services. Broadband prices have declined continuously across the OECD area, while connection speeds have increased. Most OECD countries have at least one operator offering fibre-based, high-speed broadband connections, although these may be limited to certain geographical areas. As Figure 2 shows, France and Japan had the fastest median advertised download speed of up to 100 Mbit/s in September 2010. In all OECD countries, the median advertised download speed was 15.4 bit/s in September 2010, compared to the average advertised download speed of 37.5 Mbit/s. There are considerable differences in broadband prices for fixed and wireless services across OECD countries, and sometimes in and between regions within those countries, depending on whether or not line charges are included. Barriers can also exist to trade and travel across borders, including innovation around both these activities, due to the high prices for international mobile roaming. At the same time, these barriers create significant obstacles for businesses in machine-to-machine communication across borders.

Figure 2. Average and median advertised download speeds, September 2010



Source: OECD (2011), OECD Communications Outlook 2011, OECD Publishing, Paris. <http://dx.doi.org/10.1787/888932486887> [1]

To gather broadband price and speed data, a survey of 686 stand-alone broadband offers from 102 operators across the 34 OECD countries was undertaken for the OECD Communications Outlook 2011. A set of three operators per country was chosen (with an average of seven offers per operator): the incumbent telecommunications operator, the largest cable provider (if cable exists) and one alternative provider, if available, over DSL, cable or fibre. The offers must be advertised clearly on the operator's website; all DSL, cable and fibre offers are recorded but not used in calculations if speeds are lower than 256 kbit/s; offers are for month to month service and should be available in the country's largest city or in the largest regional city for firms with only regional coverage.

Figure 1. Fixed broadband subscribers, per 100 inhabitants

What other topics relate to ICT access and innovative businesses?

State of competition (see [State of competition](#) [2]). Better ICT access increases competition by bringing more players on the market. It facilitates the globalisation of many services, making it feasible for consumers and producers of services to be in different locations. In turn, the state of competition in the ICT sector affects the access, prices and quality of services offered by ICT suppliers.

Access to foreign and domestic markets (see [Access to foreign and domestic markets](#) [3]). The development of the Internet and the improvement of ICT access have increased international trade, making it easier for companies to export and import products and services.

Skilled labour (see [Skilled labour](#) [4]). On the one hand, better ICT access allows businesses to hire and collaborate with remote skilled labour and with people from multiple locations. ICT also provides possibilities for improving educational and training processes (e.g. online classes, teaching and training materials) and can, thereby, have a positive effect on the availability of skills. On the other hand, the availability of internal ICT skills is necessary for a firm to benefit from ICT access.

What policies relate to ICT access and innovative businesses?

Public policy can influence ICT access by:

Strengthening a competitive environment that encourages the deployment of broadband across and within countries, and investment in next generation, high-capacity broadband networks. This would allow businesses to leverage the infrastructure to develop new products, services and platforms.

Developing ICT skills. Investment in human capital is essential for the benefits of ICT to be fully realised. Governments can implement e-skills and digital literacy policies, and provide companies the means to develop and improve the skills that are required to exploit the opportunities offered by ICT.

Upholding the open, free, decentralised and dynamic nature of the Internet, which is important to allow information and communication technologies to be platforms for innovation and knowledge.

Ensuring security and privacy on the Internet. The future of the Internet economy depends on whether users, businesses and governments feel safe using the network and trust it for critical applications and services. This is all the more important, since malware and incidents compromising the confidentiality, integrity or availability of information systems and networks are increasing.

Ensuring that appropriate laws and regulations are in place regarding data protection

and e-commerce. This encourages trust and the expansion of ICT usage in trading, while at the same time giving a clear warning to those who do not comply with appropriate standards.

References

- Bertschek, I., D. Cerquera, and G. Klein (2011), “More bits - more bucks? Measuring the impact of broadband internet on firm performance”, SSRN eLibrary No 1852365.
- Bloom, N., Reenen, J.V. (2007), “Measuring and explaining management practices across firms and countries”, The Quarterly Journal of Economics 122, 1351-1408.
- Bloom, N., Sadun, R., Reenen, J.V. (2009), “The organization of firms across countries”, NBER Working Paper No. 15129, National Bureau of Economic Research, Inc.
- Bresnahan, T.F., Brynjolfsson, E., Hitt, L.M. (2002), “Information technology, workplace organization, and the demand for skilled labor: Firm-level evidence”, The Quarterly Journal of Economics 117, 339-376.
- Commander, S., Harrison, R., Menezes-Filho, N. (2011), “ICT and productivity in developing countries: New firm-Level evidence from Brazil and India”, The Review of Economics and Statistics 93, 528-541.
- Forman, C. and N. van Zeebroeck (2010), “From wires to partners: How the Internet has fostered R&D collaborations within firms”, SSRN eLibrary No 1725780.
- Jorgenson, D.W. (2001). Information Technology and the U.S. Economy. SSRN eLibrary.
- Lehr, W. (2012), “Measuring the internet: The data challenge”, OECD Digital Economy Papers, No. 194, OECD Publishing, <http://dx.doi.org/10.1787/5k9bhk5fzvzx-en> [5]
- OECD (2012a), OECD Internet Economy Outlook 2012, OECD Publishing. <http://dx.doi.org/10.1787/9789264086463-en> [6]
- OECD (2012b), “The impact of internet in OECD countries”, OECD Digital Economy Papers, No. 200, OECD Publishing. <http://dx.doi.org/10.1787/5k962hhgpb5d-en> [7]
- OECD (2012d), “Machine-to-machine communications: Connecting billions of devices”, OECD Digital Economy Papers, No. 192, OECD Publishing. <http://dx.doi.org/10.1787/5k9gsh2gp043-en> [8]
- OECD (2011), “Social and economic purposes of Internet intermediaries”, in The Role of Internet Intermediaries in Advancing Public Policy Objectives, OECD Publishing. <http://dx.doi.org/10.1787/9789264115644-6-en> [9]
- OECD (2011a), OECD Guide to Measuring the Information Society 2011, OECD Publishing. <http://dx.doi.org/10.1787/9789264113541-en> [10]
- OECD (2011b), OECD Communications Outlook 2011, OECD Publishing. http://dx.doi.org/10.1787/comms_outlook-2011-en [11]
- OECD (2011c), “Broadband speed and prices”, in OECD Science, Technology and Industry Scoreboard 2011, OECD Publishing. http://dx.doi.org/10.1787/sti_scoreboard-2011-38-en [12]
- OECD (2011d), “Access to broadband”, in OECD Science, Technology and Industry Scoreboard 2011, OECD Publishing. http://dx.doi.org/10.1787/sti_scoreboard-2011-40-en [13]

-
- OECD (2011d), "The future of the internet economy: A statistical profile", June 2011 Update, OECD, Paris. www.oecd.org/dataoecd/24/5/48255770.pdf [14].
 - OECD (2010), "Annex a. methodology and definitions", in OECD, OECD Information Technology Outlook 2010, OECD Publishing. http://dx.doi.org/10.1787/it_outlook-2010-10-en [15]
 - OECD (2010), "Ministerial report on the OECD innovation strategy: key findings", OECD Paris, www.oecd.org/dataoecd/51/28/45326349.pdf [16]
 - OECD (2009), OECD Communications Outlook 2009, OECD Publishing. http://dx.doi.org/10.1787/comms_outlook-2009-en [17]
 - OECD (2009), "Background report for the OECD conference on empowering e-consumers: strengthening consumer protection in the internet economy", www.oecd.org/dataoecd/44/13/44047583.pdf [18]
 - OECD (2008), "Broadband and the economy: Ministerial background report", OECD Ministerial Meeting on the Future of the Internet Economy, Seoul, 17-18 June, www.oecd.org/dataoecd/62/7/40781696.pdf [19]
 - Oliner, S.D., Sichel, D.E. (2000), "The resurgence of growth in the late 1990s: Is information technology the story?", Journal of Economic Perspectives 14, 3-22.
 - Oliner, S.D., Sichel, D.E. (2002), "Information technology and productivity: where are we now and where are we going?", Economic Review, 15-44.
 - Paunov, C. and V. Rollo (forthcoming), "Has the Internet fostered inclusive innovation in the developing world?", OECD STI Working Paper Series.
 - Spiezia V. (2011), "Are ICT users more innovative?: An analysis of ICT-enabled innovation in OECD firms", OECD Journal: Economic Studies, Vol. 2011/1. http://dx.doi.org/10.1787/eco_studies-2011-5kg2d2hkn6vg [20]
 - Stiroh, K.J. (2002), "Information technology and the U.S. productivity revival: What do the industry data say?", American Economic Review 92, 1559-1576.
 - Von Hippel, E. (2005), Democratizing Innovation, The MIT Press, Cambridge, MA.

Related Link: Impacts of ICTs

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Links

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