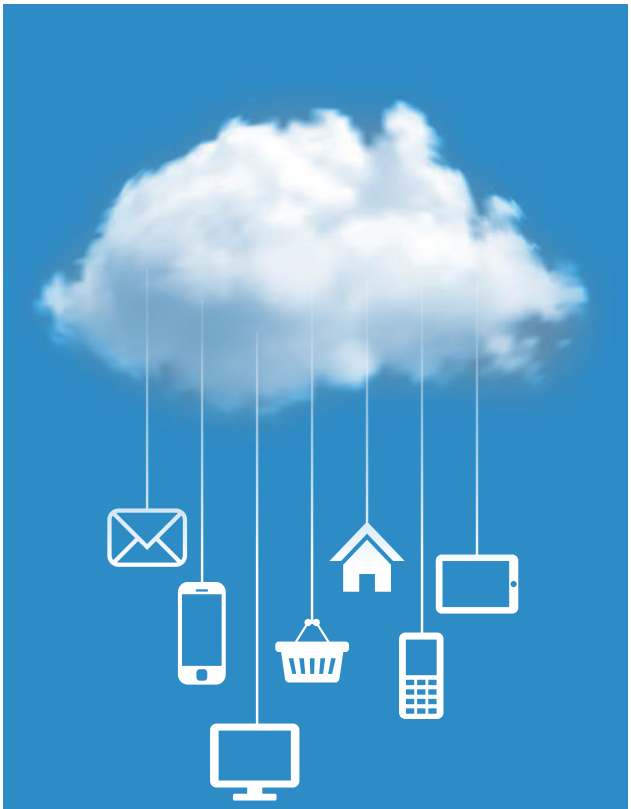

Impact of broadband

In the last ten years economic researchers have examined the evidence on broadband and its contribution to the economic performance of nations, in an attempt to quantify these benefits.

By OVUM

Governments rightly see broadband as an important enabler of economic and social development. This is just as true of developing markets as in the developed markets. Broadband infrastructure has the power to revolutionize the way we live and work, and is important to the sustainable and long term growth of national economies. It is an enabler of competitiveness, social cohesion and economic growth.

In the last ten years economic researchers have examined the evidence about broadband and its contribution to the economic performance of nations, in an attempt to quantify these benefits. This research is important, because many governments around the world have been making major investments in fixed and mobile broadband. It is natural to ask whether these policies are justified.

This is a case where academic research has practical policy implications, particularly in developing markets where demand for capital investment is high and hard choices must be made between different priorities. There are some important lessons for developing countries in the results of this research, and some of these lessons have policy implications.

What the research tells us

Economic research on the impact of broadband is a work in progress, but some clear conclusions are already available. This research falls into two broad classes: microeconomic and macroeconomic. Microeconomics is focused at the level of the firm, and studies the impact of broadband on firm behavior, strategy and organization. Macroeconomics uses tools of econometrics such as regression analysis

The implications of this research vary between developed and emerging markets, principally because developed markets typically have well-developed infrastructures, skills bases and user bases due to historical investments. In contrast, emerging countries need to attract large capital investment into telecommunications infrastructure and broadband specifically.

to determine the impact of broadband on historical economic and productivity growth.

Macroeconomic effects can be placed into two classes: impacts due to the initial construction of the broadband network, and impacts due to efficiencies that flow through to the economy.

Economic analyses of the impact of broadband rollout have tended to focus on the employment impact in developed markets in the context of the global financial crisis. The employment effects of major broadband rollout programs are significant. For example, in the United States the Brookings Institute calculated that an investment of USD63 billion in broadband would generate 546,000 jobs directly in construction and another 665,000 in other parts of the economy over ten years. These impacts are most beneficial when unemployed workers and underutilized capital can be mobilized to deliver broadband infrastructure, delivering new economic activity.

Once built, broadband provides a boost to GDP. Broadband contributes to higher GDP growth through several mechanisms. Broadband can raise firm-level productivity, but also enables new services and the associated industries to grow, and can also enable industry-level efficiencies such as outsourcing. Researchers studying OECD countries from 1996 to 2007 established a positive and significant link between broadband and GDP, finding that a 0.9% to 1.5% increase in national GDP per capita for each additional 10% of broadband penetration. Most of these studies have focused on developed economies, but one important study by the World Bank checked developed and developing markets separately for the period 1980-2002, with developing markets showing greater benefits with a 1.38% increase in GDP. Research by the ITU in 2012 found a lower level of impact, but still found positive and significant correlations between broadband penetration and growth performance in all developing markets where the data allowed statistically significant results.

The research has demonstrated some other important results. World Bank researchers argue that broadband achieves economic results when there is also an ecosystem of IT-savvy businesses and citizens who know how to use technology and IT providers who know how to deliver it. Other research suggests that critical mass effects apply; in other words, the major benefits of broadband only flow after a large proportion of the population are connected.

Microeconomic analyses of firm-level efficiencies reinforce the macroeconomic research. At the firm level, broadband enables more efficient internal business organization and inter-firm relationships that drive higher productivity and output. In addition, other analyses have demonstrated new job creation and improved engagement with global markets.

In Ovum's view these results justify the growing consensus for policy intervention to promote broadband rollout.

Implications for developing markets

The implications of this research vary

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between developed and developing markets, principally because developed markets typically have well-developed infrastructures, skill bases and user bases due to historic investments. In contrast, developing countries need to attract large capital investment into telecommunications infrastructure and broadband specifically. In Ovum's view, there are two key results of the above analyses that have specific consequences for developing markets.

First, the benefits of broadband are best realized when there are also investments in the ecosystem such as ICT skills and a supportive framework of regulation that facilitates innovation and firm reorganization. Complementary investments in skills, both technical skills and general ICT literacy, along with labor and business policies that minimize the cost of technology adoption, are needed to realize the full benefits of broadband. This means that broadband rollout policies should be part of a wider strategy to promote an ecosystem of ICT infrastructure and skills across the economy and society. Specifically, broadband promotion must not be separated from related skills, ICT literacy, business promotion and labor policies that enable businesses to use broadband to make their operations more efficient and encourage consumers to use services.

Second, the "critical mass" effect in the relationship between broadband penetration and economic benefit means that a high level of broadband penetration is needed to before significant benefits begin to flow. This means that broadband policy needs to be national in scope, with fast rollout of basic broadband access. Though based on economic reasoning, this approach is consistent with policies of social or geographical inclusion, which are also an important policy motive.

In developing markets this means that mobile technology will be an indispensable element of a broadband policy. However, Ovum also argues for focussed investment in fixed broadband as well. There are specific segments where fixed broadband is indispensable to economic development, both in its own right and as backhaul infrastructure to support mobile broadband growth.

Few developing markets can consider a mass rollout of superfast fixed broadband services, particularly fiber-based services. However, investment is easiest to justify where returns are high. There are several segments and geographies where governments in developing economies can maximise returns and achieve greater benefits early in a rollout phase. Ovum has identified several of these segments:

- Video is driving bandwidth consumption and video applications will drive bandwidth demand in the home. In addition, many consumers could work from home if they could obtain access to enterprise VPNs and clouds for applications and file transfer. In residential segments where incomes are high, willingness and ability to pay is also high. These geographies are typically in urban environments, so costs can sometimes also be lower.
- Fiber-based broadband has the opportunity to play a strong, supportive role in cloud-based enterprises. In particular, passive optical network (PON) was designed to handle multiple types of traffic with varying latency requirements. PON vendors have begun to adjust solutions for cloud-based enterprises by adding support for scalability and redundancy. Service providers and equipment vendors have developed sophisticated network models (often proprietary) to support networking requirements of various types of enterprises.

- Mobile data services, particularly those supported over LTE networks, dramatically increase the bandwidth requirement for backhaul. The emergence of heterogeneous networks, where many small cells must be integrated into the network, is generating even greater pressure because traditional mobile backhaul is expensive. Ovum estimates that "Business-as-usual" networks and equipment would cost operators $93bn globally in backhaul transport expense and would require the purchase of more than $15bn in backhaul transport equipment annually through 2017. This would place a severe burden on mobile broadband operators. Fixed broadband networks, particularly PON networks, can provide the backhaul required. This is a geographical fit with the enterprise segments discussed above, since most mobile traffic is created in urban areas, such as train stations, shopping malls, athletic stadiums, concert venues which are not far from high-density residential and enterprise locations.

Policy implications for developing markets

Ovum's observations of broadband policies around the world have identified policy approaches that will maximize the benefits of policy intervention. In particular, competition regulation, broadband funding and standardizing construction all have a role to play.

Competition regulation that reduces returns on investment will discourage investment in broadband, and may prevent it completely in these early stages. The investment required to build fixed broadband networks is large. The critical mass effect means that returns on investment can be low in the early stages of rollout. Ovum's view is that heavy-handed regulation of wholesale fixed access will delay rollout and the associated economic benefits. Instead, we recommend that developing countries adopt a light-handed approach to regulation in the early years, allowing investors to capture the benefits of vertical integration until a long-term investment return is possible. In particular, fiber unbundling has been pursued in very few markets, and is not recommended for developing countries.

For example in Malaysia, Telekom is providing access to its fiber broadband network, but is allowed to do so on commercial terms. In addition, the Malaysian Government is investing some of its own funds in the network to help improve Telekom's return on investment. The result has been a significant investment of private sector capital in fixed broadband network that will be a long-term platform for innovation in the country.

We recommend that developing countries open the market to alternative infrastructure providers. This is most advantageous where these providers are encouraged to work together in network sharing partnerships with larger pools of capital. We also recommend allowing mobile operators and foreign investors to enter the fixed broadband market for the same reason.

Public funding will probably be needed to improve the business case for broadband investment. The high up-front costs, combined with the critical mass effect, mean that it is difficult for private investors to find a stand-alone business case for national investment. Ovum has observed several mechanisms for financial support of broadband investment around the world. These include direct investments in publicly-owned networks, grant funding in private networks, private-public partnerships to leverage private investment from public contributions, and tax incentives for investment.

We recommend that governments first consider using public funding to mobilize private investment through private-public partnerships (PPPs). PPP approaches have the advantage that they magnify the impact of public contributions by leveraging additional private capital into broadband rollout. The impact of policy is then not limited to the government's own resources, but is strengthened by the commitments it can mobilize outside government as well. PPPs have been adopted in both developed and developing countries such as Malaysia and New Zealand. In these cases, the public investment is often made on a concessional basis, with the government accepting either a lower commercial return or higher share of the commercial risk in order to make private investment more attractive.

Finally, governments also have an important role to play in the coordination of passive infrastructure that can be shared between different utilities. Much of the cost of broadband, particularly fixed broadband, is in civil works and these costs can be minimized if trenching and other forms of passive infrastructure can be shared between telecommunications, power and other utility providers. Cost minimisation strategies are typically implemented in planning or building codes, to ensure that opportunities for synergy and cost sharing are taken as infrastructure is rolled out in new and old neighborhoods. This kind of coordination can only be achieved by governments. Also, building standards to ensure that new residential and business real estate are provisioned to support fixed broadband are recommended.