

bagging BROADBAND productivity

Fast internet access is widely considered to be a productivity-enhancing factor, leading to calls for governments to finance new fibre-to-the-home (FTTH) networks. But Mark Obren has surveyed the literature on productivity gains from broadband deployment – and he finds that the relationship is neither simple nor straightforward.

To take one example: the New Zealand Institute has estimated that the economic benefits to the country from an FTTH network would be in the order of \$2.7 to \$4.4 billion per year,¹ a figure which has been used extensively in support of the government's current \$1.5 billion investment plan. Although there are undoubtedly some benefits to be gained from faster network deployment, it is far from clear that gains of the magnitude being used to support funding proposals are in fact reliable estimates.

Most claims lack rigorous empirical support, instead being based upon extrapolations from extremely limited qualitative and case-study analyses or even subjective 'guesses' proffered by 'industry experts' with (quite likely) vested interests in a network of a particular typology being deployed in a specific economy. The use of such studies to support government spending has led DSL Prime's Dave Burstein to observe 'both the economic and social benefits of broadband are wildly overstated ... There's a social return to better broadband, but it's far, far lower than the hype suggests. Most of the numbers thrown about are from shills and zealots. Honest academics looking for the effects find only modest ones'.²

Reality check

Empirical evidence of the impact of broadband on economic performance is sparse but growing and, as Burstein observes, finds only modest gains which are often highly nuanced. For example, research using US zip-code data finds that the gains are quite small and do not accrue evenly to all sectors of the economy;³ it also finds that the benefits are decreasing as broadband penetration increases.⁴ New Zealand firms with access to broadband internet connections were found on average to be around 10 percent more productive than their counterparts without broadband, but

¹ www.nzinstitute.org/Images/uploads/Broadband%20aspiration%20Sept%202007.pdf
www.nzinstitute.org/index.php/weightlesseconomy/mediarelease/the_new_zealand_institute_proposes_the_creation_of_a_new_vehicle_to_deliver/

² D Burstein (2010) 'NBN deal a good thing but don't overstate the benefits' *Communications Day* 21 June p10 (available at www.commsday.com/commsday).

³ S Greenstein and R McDevitt (2009) *The broadband bonus: accounting for broadband internet's impact on U.S. GDP*. NBER Working Paper 14758.

⁴ W Lehr, C Osorio, S Gillett, and M Sirbu (2006) 'Measuring broadband's economic impact' originally presented at the 33rd Research Conference on Communication, Information, and Internet Policy (TPRC) in Arlington, Virginia on 23-25 September 2005 and revised 17 January 2006 (available at http://ebusiness.mit.edu/sponsors/common/2005-Fall-Res-Seminars/Lehr_MeasuringBroadbandsImpact.pdf).

those with ‘fast’ connections were no more productive than firms with standard-speed broadband connections.⁵

Moreover, even in those sectors such as education and health which have been heralded as areas where large gains can be made from wider availability of faster broadband, empirical results crowd-out optimistic hopes. Two examples: analysis of the performance of North Carolina grades 5 to 8 after the introduction of home computers and broadband access found statistically significant and persistent negative effects on student mathematics and reading test scores and a broadening rather than a narrowing of achievement gaps;⁶ analysis of live versus internet media instruction of an otherwise identical introductory microeconomics course at a large United States university found face-to-face instruction outperformed internet instruction.⁷

That the observed returns to broadband investment are turning out to be far smaller than might have originally been projected leads to the question of whether evidence is emerging of a ‘broadband productivity paradox’ reminiscent of the ‘computer productivity paradox’ of the 1980s and 1990s that led Robert Solow to famously state ‘you can see the computer age everywhere but in the productivity statistics’.⁸ That such a possibility might exist was raised in ISCR research as early as 2002,⁹ when it was noted that broadband is simply a subset of Information and computer technologies (ICTs) and so might exhibit similar productivity characteristics. More recent research by Howell and Grimes¹⁰ draws attention to the fact that there are both positive and negative productivity consequences arising from faster broadband deployment – and it challenges policymakers to think carefully about a wide range of factors rather than unquestioningly assuming that faster broadband will be unequivocally beneficial. Drawing upon questioning frameworks developed to address the likely causes of the computer productivity paradox, Howell and Grimes developed two contrasting hypotheses: that the productivity gains from faster broadband are real but are yet to be detected; and that the gains are not detected because they don’t exist – that is, broadband is simply not as productive as its proponents have led us to believe that it will be. They then critically assess each of the hypotheses, using theoretical and empirical evidence.

⁵ A Grimes, C Ren, and P Stevens (2009) ‘The need for speed: impacts of internet connectivity on firm productivity’ Motu Economic and Public Policy Research Working Paper 09-15.

⁶ J Vigdor and H Ladd (2010) ‘Scaling the Digital Divide: home computer technology and student achievement’ NBER Working Paper 16078.

⁷ D Figlio, M Rush and L Yin (2010) ‘Is it Live or is it Internet? Experimental estimates of the effects of online instruction on student learning’ NBER Working paper 16089.

⁸ R Solow (1987) ‘We’d better watch out’ *New York Times Book Review* 36 (July 12).

⁹ B Howell and M Obren (2002) ‘Broadband Diffusion: Lags from Vintage Capital, Learning by Doing, Information Barriers and Network Effects’ (available at www.iscr.org.nz/n222.html).

¹⁰ B Howell and A Grimes (2010) ‘Productivity Questions for Public Sector Fast Fibre Network Financiers’ *Communications and Strategies* 78.

Now you see it, now you don't

In respect of the first hypothesis, real gains may not have been detected because of any one of these reasons:

- A lack of clear delineation in speeds between 'fast' and 'slow' broadband may have confounded the results.
- As fast broadband is still in its early days of deployment, it may be too soon to discern productivity gains because the applications taking advantage of it have not yet been developed – or they have been developed but it will take time for users to know of their existence, learn how to use them productively, or make other complementary investments that liberate the gains.
- The benefits are garnered at some other point in the production chain that was not observed in the study (such as customers with reduced search costs).

Support for this hypothesis comes from a growing body of evidence that productivity gains from ICTs have been found to be critically dependent upon complementary investments (such as in human capital and redesigned production processes), and that they lag behind the time of investment by several years. However, in order to attribute the gains to investment in faster (as opposed to standard speed) broadband, it must be clear that the additional benefits come from the speed of the broadband connection and from the applications that are operational only on those faster connections (rather than from simply the availability of any broadband access or even dial-up internet access). In the absence of any compelling new or different applications emerging in those countries where faster broadband networks have been made available longest (such as Japan and Korea, where they have been available for more than five years) or where resources have been devoted specifically to the development of such applications (such as the Netherlands), it becomes more difficult to justify investments in faster networks using the argument that 'you don't see faster broadband in the productivity statistics, but wait a bit and you will'.

There's no there, there

The second hypothesis asserts that 'you see faster broadband everywhere but in the productivity statistics because faster broadband is not as productive as you think'. Five plausible arguments support this hypothesis:

- Returns to investment in broadband speed are diminishing, because the biggest gains were made when the relevant applications were first made available on the internet. The remaining benefits are marginal rather than average ones, and are decreasing relative to the costs of enabling them.
- Most of the observed gains are simply one-off adjustments and are not sustainable growth engines. They relate to single applications that support the production of standard (rival and excludable) products; they are not 'information goods' exhibiting increasing returns.
- The contribution of broadband-enabled activities comprises only a very small part of the value chain for most economically significant activities, and so a small change in a factor

that is a small part of the overall value chain will render only a small – and possibly empirically undetectable – change.

- Broadband networks are leading to an alteration in the composition of the firms in an economy by altering the balance between existing (highly productive – the intensive margin) users and new (less productive – the extensive margin) users, to the detriment of aggregate economic productivity measures.
- Externalities are created that detract from the benefits accrued. Examples include the use of the technology to maintain existing market positions (rather than to increase productivity), duplication of existing processes, and increasing consumer costs (which arise from consumers being required to choose from a wider range of more complex options).

The ways in which broadband contributes to economic growth are complex, but one important factor stands out: applications, not networks, will determine the ultimate dividend.

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