



**NEW ZEALAND INSTITUTE FOR THE STUDY
OF COMPETITION AND REGULATION INC.**

ULTRAFAST BROADBAND: FEEDING A NEED FOR SPEED OR FUNDING A FIBRE ARMS RACE?

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MainPower Trust

Meridian Energy

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Telecom Corporation of New Zealand Ltd

Victoria University of Wellington

Westpac Institutional Bank

MOTIVATION

Grimes, Ren & Stevens (2009) *The Need for Speed: Impacts of Internet Connectivity on Firm Productivity* (hereafter 'GRS')

http://motu-www.motu.org.nz/wpapers/09_15.pdf

- large NZ dataset using unit record firm financial data and survey data
- paired firm comparison examining differences in broadband connection type
- broadband adoption boosts productivity, but no productivity differences across broadband type ('fast' or 'standard')

A surprising result?

- what might explain the finding



JOINT WORK WITH ARTHUR GRIMES (MOTU)

Howell, B. & Grimes, A. (2010). Productivity Questions for Public Sector Fast Fibre Network Financiers. *Communications and Strategies*. 78: 127-45.

http://www.idate.org/en/Digiworld-store/Collection/Communications-Strategies_18/No-78-New-business-models-for-Next-Generation-Access_480.html

Not saying that fast fibre broadband has no productivity effect

- rather, that it is not as large as commonly presumed
- and is conditional upon presence of other factors (e.g. specific industries; demands for specific applications; complementary investments)



FIBRE AND PRODUCTIVITY

Fibre

- faster
 - time savings from existing applications
- greater capacity
 - enabling new applications not feasible on standard broadband

GPT theory

- standard broadband ‘legacy’; fibre ‘frontier’
- frontier will supplant legacy when benefits of frontier (less adjustment costs) exceed benefits of legacy
 - including any complementary investments
- marginal benefits given standard broadband already exists
 - not average benefits from any broadband



A BROADBAND PRODUCTIVITY PARADOX?

Is fast fibre broadband really as productive as has been commonly presumed?

- if fast is good, then surely faster is better?
- think Concorde/B747; pushbike/Ferrari
 - it all depends on the application

Computer productivity paradox

- “you see the computer industry everywhere but in the productivity statistics” Solow (1987)
- “you see (faster) broadband everywhere but in the productivity statistics?” Howell & Grimes (2010)



HISTORY AS TEACHER

Critical literature from the 1980s and 1990s 'computer productivity paradox'

- Triplett (1999), Gordon (2000), Bosworth & Triplett (2001)
inter alia

H1: real and material gains available, but not detected in the study

H2: few widespread gains available at present point in time, given activities of businesses using broadband and range of available applications



HYPOTHESIS 1: THE CLAIMS

Gains available, but not detected

- too soon to see the benefits

“You don’t see (faster) broadband in the productivity statistics yet, but wait a bit and you will”

- fast broadband is new, not widely deployed, so too soon to see the benefits as it is not widely used
- applications yet to be developed
- it takes time for users to become aware of applications, benefits
- it takes time to learn to use the applications
- complementary investments need to be made



HYOTHESIS 1: THE EVIDENCE

NZ firms: early and high levels of broadband adoption

- 80% by 2006 (study looked at 2006-8)
 - already appropriated most of the gains from broadband use
- but fewer than 10% of firms using fast broadband in 2008
 - these firms showed NO improvement compared to the paired firms

But what are the *gains* (marginal benefits) from *faster* broadband?

- evidence from countries where faster broadband available
 - Japan, Korea - high levels of uptake observed, but no evidence of substantially different applications used (except for residential entertainment)
 - Netherlands - “less successful in developing advanced services”
Sadowski, Nucciarelli & de Rooij (2009)



METHODOLOGICAL PROBLEMS?

“whether or not you see computers everywhere, some of what they do is not counted” and/or

“you may not see computers everywhere, but in the industrial sectors where you do see them, output is poorly measured”

GRS

- firm level analysis : gains may accrue to other stakeholders
 - travel agent example
- gain attends the application, not the connection
 - accommodation aggregator/low information volume
- data definitions
 - is cable really fast?
- does it include industry sector factors?
 - information-intensive vs not?



H2: FASTER BROADBAND ISN'T MATERIALLY PRODUCTIVITY-ENHANCING

“you see computers everywhere but in the productivity statistics because computers are not as productive as you think”

“some may wish to see faster broadband everywhere, and it may have been portrayed as having great productivity benefits, but will it really be as productive as its promoters have claimed it will be?”



FIVE QUESTIONS

Are the returns to investment in broadband speed diminishing?

Are observed gains simply one-off adjustments or evidence of the creation of sustainable growth engines?

How important is the broadband network in the production value chain?

Do broadband networks affect productivity by altering the composition of firms within the economy – i.e. altering the balance between existing exporters (the intensive margin) and new exporters entering the market (the extensive margin)?

Are externalities created that detract from the benefits accrued?



DIMINISHING RETURNS

Have costs of production fallen faster than gains in utility from new applications?

Marginal gains vs marginal costs

- wordperfect => Word95 => Word?? => ????
- increased processing capacity but marginal additional benefit
- have greatest gains from broadband already been garnered?
 - facebook, twitter vs email, fax, postal letter, pigeon post marginal benefit now small cf first digitalisation
- rich graphics, but how much more information is conveyed?
- faster network => only gain is the time saving from doing the same thing slightly faster; marginal valuation of time may be small

New fibre networks – the end of endlessly decreasing marginal network infrastructure costs?



ONE-OFF RETURNS OR SUSTAINABLE ECONOMIC GROWTH?

Returns to broadband tail off as diffusion increases

- later adopters are lower-valuing laggards
- faster broadband not likely to be different

Adopting the application (not the network) confers the gain

- benefits come once only from adoption
- word vs novel example
 - information may exhibit increasing returns, but that does not mean the technologies that aid its production and transportation will
- majority of goods produced are rival, tangible
 - increasing returns require increasing application developments AND benefits that exceed the costs of their development
 - faster networks may just mean we get decreasing returns faster



BROADBAND IN THE PRODUCTION CHAIN

“you don’t see computers everywhere in a meaningful economic sense (because) computers and information processing equipment are a relatively small share of the capital stock”

ICT’s share of capital stock has increased

- but broadband’s share of ICT stock is still small
- information transport is a very small proportion of the input costs of most goods
 - and sometimes information not revealed is more valuable than information broadcast
- a small improvement in something already quite small may be too small to be detected



WHAT IS THE TRULY SCARCE RESOURCE?

“a wealth of information creates a poverty of attention”

“the brown UPS trucks are thriving with e-commerce, but each truck still requires one driver”

Not all bits transported are valued equally

- time criticality as value
- but storage is cheap
 - implications for the timing of network build, cloud computing

Are underpinning assumptions aspirational or evidential?

- the early adopter is not the average user
- actual usage might not match espoused levels



INTENSIVE VS EXTENSIVE MARGIN

Fibre investments become a form of trade barrier

- countries compete for firms on basis of fibre networks
- highly productive firms with demand for fibre move to the fibre-rich country
- domestic workers with skills move to the new country

Non fibre-intensive firms with long investment horizons

- cannot anticipate how applications will develop
- so locate in fibre-rich country to have options to use in the future

Leads to economic ‘hollowing out’ in the ‘old’ country

- lower productivity as a consequence
- and fuels ‘Fibre Wars’



EXTERNALITIES: NEGATIVE? (UN)EXPECTED?

Investments to protect market share or poach another firm's customers are a zero-sum game

- redistributions do not create welfare

Translating old activities into digital form is not creating new wealth

- may be one-off gain, but not sustainable

New technologies, choice in delivery

- increased costs from duplicate methods => productivity declines
- Choice is costly for the consumer

Productivity on the job may be impaired by increasing use of web for personal activities



CONCLUSION

Not to say that fibre broadband is not productivity-enhancing

But

- likely not as productive as some might wish
- may be confined to specific firms, applications and not generally applicable

Must think carefully about how a faster connection actually increases productivity

- is faster broadband both necessary and sufficient?
 - application can't be delivered on standard broadband
 - time criticality has tangible value
- challenge for policy-makers considering subsidies

