



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

REGULATING BROADBAND NETWORKS: INSIGHTS FROM NEW ZEALAND

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THE PRESENTATION

Background

- New Zealand context
- my research on evidence-based policy-making
 - theory
 - practice

Applications of evidence-based broadband policy-making

with many illustrations

NZ and US focus

plus other OECD exemplars



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NZ CONTEXT

World leader in light-handed/competition law-based telecommunications policy in 1980s and 1990s

Accelerated retreat to extremely rigorous pursuit of OECD access regulation orthodoxy in the 2000s

OECD-leading (outside of Asia) again (along with Australia) in government funding and specification of nationwide FTTH networks



WHAT IS BROADBAND?

A digital data transportation mechanism

The current 'frontier' of the **INTERNET** GPT

- legacy = dial-up

There is a **TRANSITION** from the legacy to the frontier

In the context of

- convergence of many media onto a common digital format
 - audio, video, etc.

At the same time as

- the proliferation of network technologies capable of transporting digital data
 - fixed/mobile; copper, HFC, optical fibre, cellular, wireless, satellite

The frontier will keep getting pushed out further

- stable digital data transportation policy



ITS NOT “FIXED LINE VOICE TELEPHONY MARK II”

The context is different

Diffusing into a ‘contestable’ marketplace

- multiple network technologies
 - fixed/mobile; copper, optical fibre, HFC, wireless, cellular, satellite
- multiple (and volatile) application/user base
 - extreme variations in user preferences for individual applications/bundles
 - applications not ‘tied’ to specific networks, locations or even individuals

We have multiple case histories to inform policy

- most notably the (recent) diffusion of mobile networks



WHAT IS THE 'BROADBAND PROBLEM'?

Economic aspirations?

Social inclusion objectives?

Addressing real or perceived needs or inequities?

- private gains available as well as social

Enabling capture of external social benefits (distinct from private)?

Regional development?

International/inter-regional infrastructure?

A reason to regulate/keep regulating telcos intensively?

Vote-farming?

Subsidy-gathering?



ECONOMIC GROWTH IMPERATIVES

Demand for the internet is **derived** from the value end-users accrue from **APPLICATIONS** using the internet

- (demand-side) network effects derive from common access to specific applications, independent of the 'last mile' connection type

CONNECTIONS to the internet enable the potential for end users to derive benefits

- necessary but not sufficient for economic benefits to accrue
- applications are (mandatory) complementary investments
- interactive conversations were the application that rendered the economic benefits of telephony connections
 - network effects attend to **application** interconnection (e.g. mobile)
 - distinct from (supply-side) scale economies



EFFECTS

It enables

- benefits from using new applications not possible on dial-up
 - noting internet applications are mostly digital substitutions for non-digital applications (and consumer budget constraints prevail)
- accrual of the *marginal* benefits (net of costs) from using
 - existing applications on a more capable network (e.g. faster response times when browsing/downloading)
 - example: video on demand – a substitute distribution mechanism for television, physical DVDs? Parallel is same goods distributed by rail rather than canal. Has not changed underlying budget constraints (money or time)

Ultra-fast broadband (e.g. optical fibre to the premises)

- simply pushing the (speed and capacity) frontier out a little further (and the frontier keeps shifting in a technologically dynamic environment)



A CAUTIONARY TALE

Is there an indisputable causal relationship between 'broadband' (however measured) and economic growth?

Roller & Waverman (2001)

- **telecommunications** investment (not broadband)
- data from 1970-1990 (predates even the internet)

There is likely some effect (with caveats)

- e.g. Czernich, et al (2011); Rohman & Bohlin (2012)
- but neither simple nor unidirectional (Howell & Grimes, 2010)
- much smaller effect than indicated in initial 'hype'

(Greenstein & McDevitt, 2009; Kenny & Kenny, 2011)



HOW TO MEASURE IT?

BROADBAND UPTAKE PER CAPITA

Uptake per capita of a specific broadband

- speed
- infrastructure type

(Faster) broadband (unequivocally) drives economic growth; Consequently

Broadband is good, so

- more broadband is (unconditionally) better than less?
- faster broadband is (unconditionally) better than slower ?
- having it sooner is (unconditionally) better than having it later?



OECD DATA AND POLICY IMPERATIVES

Broadband competitiveness: an Olympic sport?

the economic competition/gold medal will be 'won' by the region/country/province/city that has the highest uptake and fastest broadband soonest (or if we can't win, we'd better place better than our fiercest rival)

Equity:

observed divides in speed/access/utilisation/uptake will

- identify winners and losers
- proffer 'evidence' of 'failed' broadband policies



KEEPING UP WITH THE JONESES / KIMS / WATANABES?

“Tenth is ten places to low as far as I’m concerned”

George W Bush (2004)

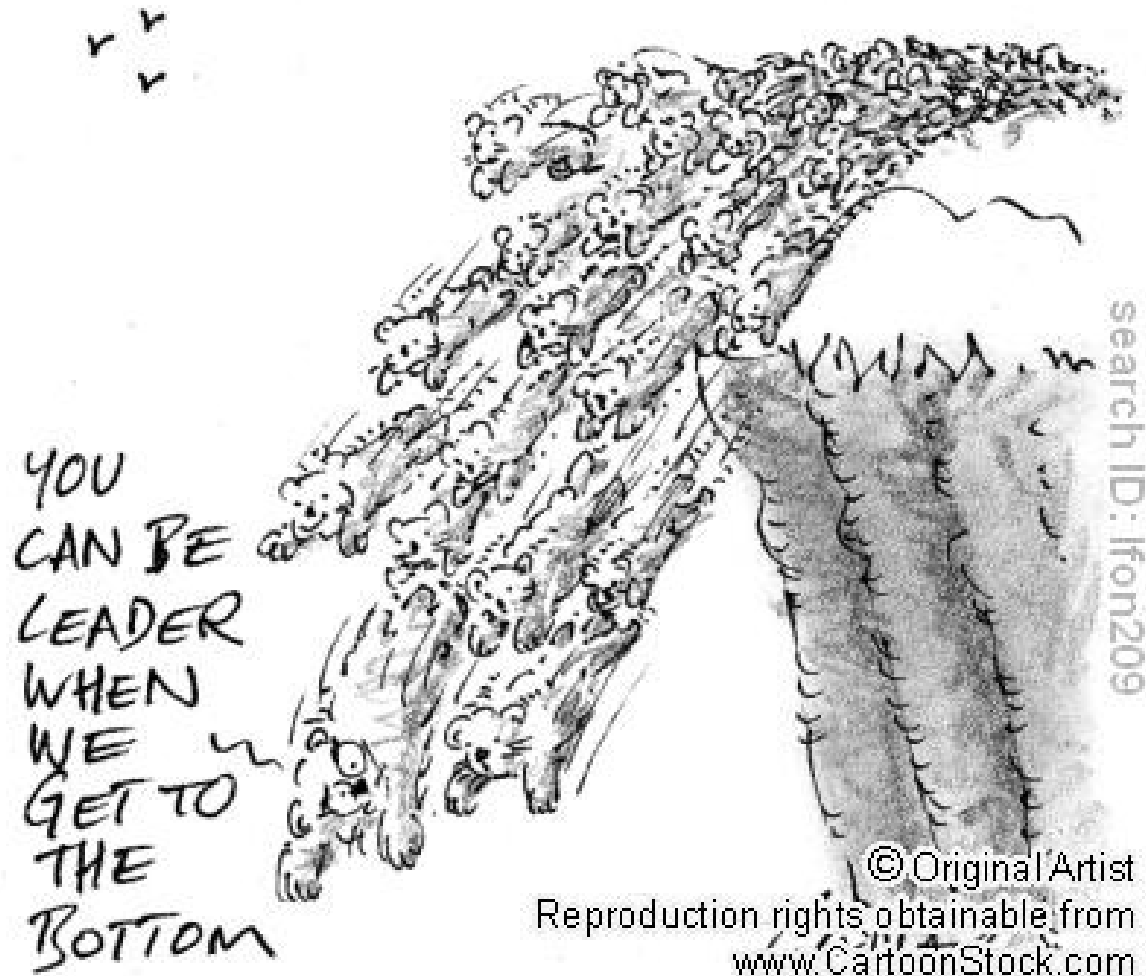
- broadband uptake per capita

“ and ensure targets for broadband uptake for the next three years as outlined in the Digital Strategy are met”

Helen Clark (2005)

- broadband uptake per capita in top quartile of the OECD
- more than 33% of connections retailed by new entrants





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WHY BROADBAND UPTAKE PER CAPITA?

We once used something like it (telephone connections per capita) to tell us something about how well some historic policies (telecommunications privatisation and liberalisation) were working

Data are available and comparable (or at least, the bureaucratic apparatus to get some broadly comparable information about broadband connections sold by telcos was available at (relatively) low cost

But should not stop the quest for better/different scenarios

‘Contestability’ of the models

- quasi-judicial processes assist in determining which model(s) best explain the (circumstantial) evidence



IF BROADBAND UPTAKE PER CAPITA IS A METRIC, WHAT IS THE OBJECTIVE?

What is the 'correct' (most efficient) rate of broadband

- deployment
- uptake
- utilisation

for a given economy

- currently; and
- over the lifecycle of the technology



THE MERITS OF MULTIPLE METRICS

Korea – very high initial levels of bbu per capita historically

But secure servers per capita? Domain names per capita?

(a proxy for comparative use of broadband for commercial transactions)

Korea - never been out of the lower quartile of the OECD

USA, NZ – never been out of the top third of the OECD

Faster, cheaper connections lead to higher uptake per capita?

Japan – 63% of broadband connections are fibre (OECD Dec 2011)

but 16th/34 in bbu/capita

USA 15th, NZ 17th

Korean researchers question original policy objectives

- national economic benefit from connectivity or a ‘showcase’ for exportable Korean technology? (Shin et al, 2012)



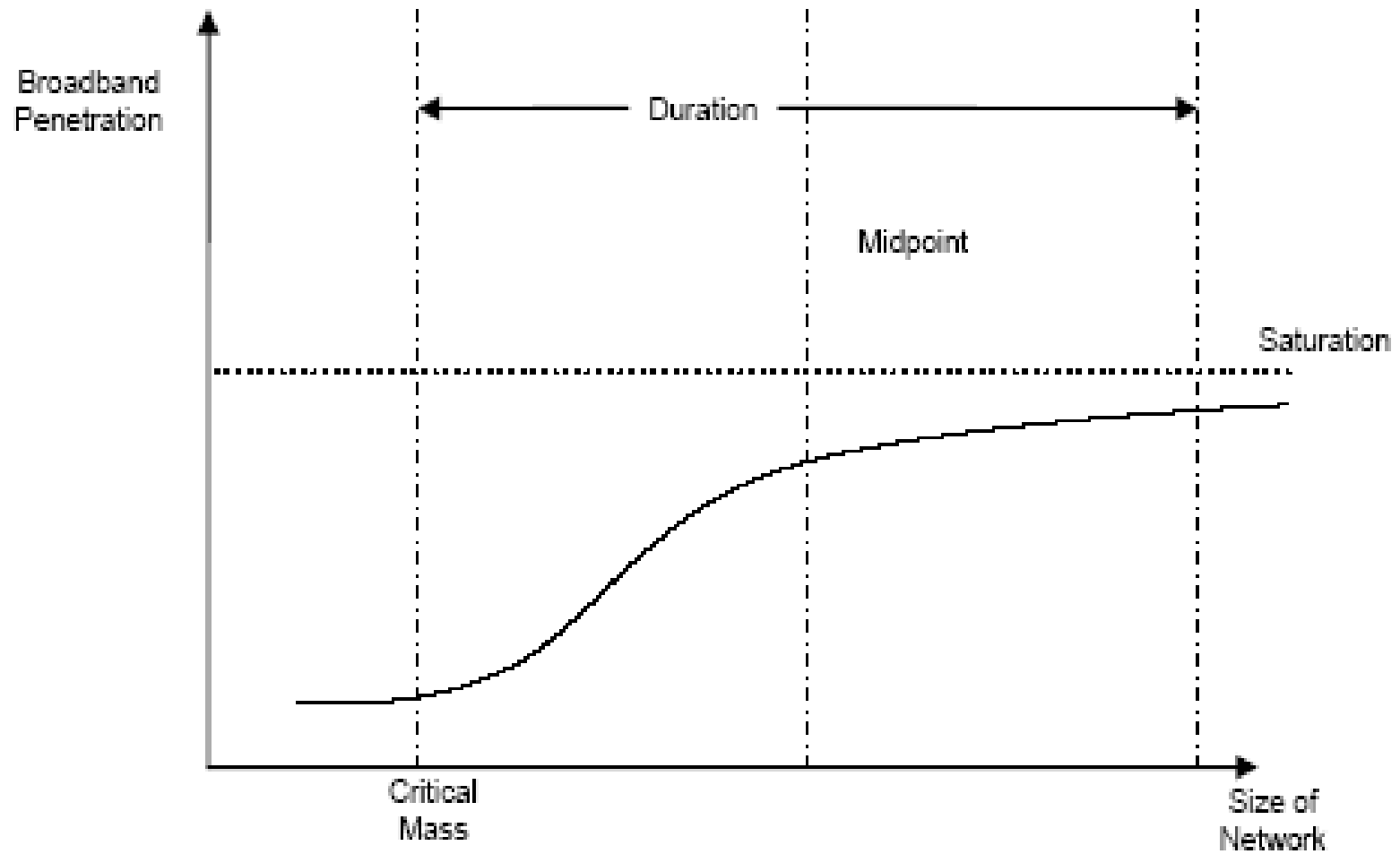
BROADBAND IS DIFFERENT

Early to mid-stage of life cycle

Network proliferation, telcos not only suppliers
full/partial substitutes, at least for some users

Extreme diversity of users, applications





COMPETITIVE INTERACTION IS DIFFERENT

Early stage/immature technology

- highest prices as supply is limited
 - risks (supply and demand side) with unproven technology
- earliest adopters have highest valuations

Mid-stage

- prices decrease as
 - more information comes available => risks reduced
 - production efficiencies accrue; more suppliers enter market (or new applications raise benefits of the marginal purchaser above price)
- consumers with increasingly lower valuations purchase
 - so the marginal benefit per new connection decreases

Late stage/mature technology

- only very low-valuing laggards have not yet purchased => very low benefits of increased connectivity



BROADBAND UPTAKE: A COMPLEX WEB OF INTERACTING FACTORS

User characteristics

- wealth, age, education, time, gender

Demographic and geographic characteristics

- population density, urbanisation
- national wealth
- weather/temperature

Social and market characteristics

- competing applications for resources
 - including infrastructure competition
- availability of alternatives/substitutes



MODELS AND MATERIALITY

(Boyle, Howell & Zhang, 2008)

Relative explanatory power of other statistically significant variables

- in 15 of 20 distinct models examined, NZ's actual broadband uptake performance exceeds model prediction
 - low GDP per capita biases expectations downward in most models

LLU coefficient matters as well as statistical significance

- de Ridder (2007) model applied to NZ data
 - having LLU in place would have led to 20,000 extra connections in 2007 (of a total of 700,000)
 - doing nothing (year dummy) had 9 times larger effect on uptake than LLU
 - is remedy worth the potential costs (e.g. investment disincentives) for such a small gain?



ACCESS REGULATION/LLU

But what overriding objective is it addressing?

- market liberalisation (historic) or broadband uptake (forward-looking)?

”Broadband service and affordability, however, have consistently lagged well behind demand and progress in information technology, with damaging results. The Internet revolution remains incomplete and threatens to stagnate if the situation continues The continuing dominance of ILECs (incumbent local exchange carriers) in that market impedes the healthy, and much-needed, development of an efficient broadband market. The result of these policy and market failures is inadequate technological progress, innovation, and productivity in advanced Internet services and telecommunication services generally.”

Ferguson (2004)



DANGERS FOR DECISION-MAKERS

(Daniel Kahneman & Amos Tversky)

The 'sunk cost problem'

- having invested in the policy, it is difficult to walk away from it
 - strong motivation to use new circumstances to justify past decisions ('ladder of investment' as ex post rationalisation?)
 - policy harmonisation limits counterfactual evidence availability

The 'availability bias'

- policies
- data
- models
- econometric skills vs understanding of industry dynamics



AND WHY COMPETITION POLICY?

If the policy objective is increasing uptake

- *then* increased ‘competition’ is a means towards the end of increased uptake **only if a competition problem MATERIALLY IMPEDING broadband uptake at the current stage of the technology’s diffusion ACTUALLY EXISTS**

Most models testing for competitive effects find infrastructure competition has a much larger effect on uptake than services competition (e.g. Distasio et al, 2005)

- if LLU drives uptake via price reductions, in a dynamic environment, how much of any price reductions observed can be attributed to LLU (compared to other factors, such as time in the diffusion process)



NEW ZEALAND EXAMPLE

It ***MUST*** be a competition problem because we have a dominant firm

Presence of dominance alone is not evidence of its exertion (Howell, 2003; 2006; 2007)

- theory suggests dominant firms overcharge and underinvest, thereby delaying uptake
- 2003 - NZ's broadband uptake in the lower third of the OECD
- prima face evidence of exertion of dominance?

NO!!!

- By 2002, 85% of telephone lines were ADSL-capable (2Mbps)
- prices in lowest quartile of the OECD (adjusting for average usage)



MARKETS HAVE A SUPPLY SIDE *AND* A DEMAND SIDE

No evidence of a supply-side 'problem'

But what about the demand side?

- NZ had highest uptake of internet per capita in the OECD
- BUT A VERY CHEAP BROADBAND SUBSTITUTE
 - unmetered local calling
 - average of 35 hours per month per ISP account on line
- marginal benefits of substitution from dial-up to broadband must be very much larger than in pay-per-minute regimes to justify substitution (Howell, 2007, 2008)
 - in 2003, at least, very few high-bandwidth applications available that the majority of heavy internet users were prepared to pay a premium (NZ\$30/month) to use



NZ REGULATOR AGREED

Recommended against full LLU in December 2003

- demand-side arguments plus dynamic efficiency argument that intervention would interfere with supply-side investments in FTTN

But in ‘political gains from trade’, recommended ‘bitstream unbundling’ be mandated (more later)

- would enhance downstream ‘services competition’
- with fewer supply-side disincentives than full LLU



(STRUCTURAL) SEPARATION: THE 'NEXT FRONTIER'?

Context matters

New Zealand 2007

- the fixed costs of functional separation for Telecom were the same as for BT
- but the addressable market is less than 1/12th the size
- benefits need to be more than 12 times greater to justify?
- no quantitative analysis undertaken (or even deemed necessary)
 - confounding historic (liberalisation) and future (broadband uptake) objectives
 - the presence of dominance was deemed sufficient (even in absence of evidence of a real, as opposed to relative, 'uptake problem')



CONDUCTING AND EVALUATING EVIDENTIAL STUDIES FOR POLICY MAKING

There is no substitute for understanding both the
*underlying industry drivers AND econometric
modelling processes*

Is the variable of interest the only factor that could
explain the observed effect?

- triangulating with other data/information
- alternative models with the same data
- alternative data with the same model



BOYLE, HOWELL ZHANG (2008)

The question:

Does a policy intervention (local loop unbundling) increase broadband uptake per capita?

Prosecution

- De Ridder (2007) – yes (statistically significant)
 - OECD panel data 2004-7
 - the longer that llu has been in place, the greater the effect on bbu/c

Witness for the Defence

- BHZ – two ‘problems’ with de Ridder
 - econometric methodology (effect disappears when taking account of robust standard errors) – challenging admissability?
 - alternative scenario better fits the evidence (even if LLU was statistically significant)



IN EARLY TO MID-STAGE DIFFUSION

The single biggest influence on uptake in the early stages of a technology's life-cycle will be the natural diffusion process

De Ridder model implies effect of LLU increases over time as prices become lower

- seems implausible as LLU would lead to stepwise upward adjustment in diffusion level

When was llu implemented in OECD countries?

- for some, it was before broadband was even available!

Respecifying the model – time bb available, time llu available

- LLU no longer statistically significant
- almost all the effect in de Ridder attributable to time bb available



APPLICABILITY/ADMISSABILITY OF PRECEDENTS

Berkman (2009) applies de Ridder (2007) without BHZ modelling adjustments

- predicts the price effect will get larger the longer LLU has been in place (and conducts regressions to verify this)

But the price would have gotten lower anyway due to technological innovation in production technologies regardless of any effects of regulation (Howell, 2009)

- for Berkman model to be credible, it must separate the effects of price decreases due to regulation from 'naturally occurring' price decreases due to real cost reductions
- regulation would cause a 'step-change' in the price path so best modelled with a 1/0 LLU variable
 - BHZ - no effect using this specification



APPLICABILITY/ADMISSABILITY OF ECONOMETRIC EVIDENCE

Berkman (2009) applies de Ridder (2007) without BHZ modelling adjustments

- and omitting data for Switzerland (claims the effect of LLU is stronger when Swiss data omitted)

But Switzerland was one of only 4 countries (of 30) in sample where LLU not implemented

- and had top quartile OECD uptake ranking

What is logical justification for omitting Swiss data

- historical precedents for general bbu ‘driver’ models (Korea – unique government subsidies known to distort modelling)
- but not when LLU effects are ‘on trial’



‘AVAILABILITY BIAS’: EXPLAINING THE DATA IN LIGHT OF POLICY INTERVENTION

1. Policy intervention implemented
2. Target metric increased
3. Therefore
 - a) any/all increase is due to the policy intervention
 - b) no further investigation is warranted????



BACK TO THE NZ EXAMPLE

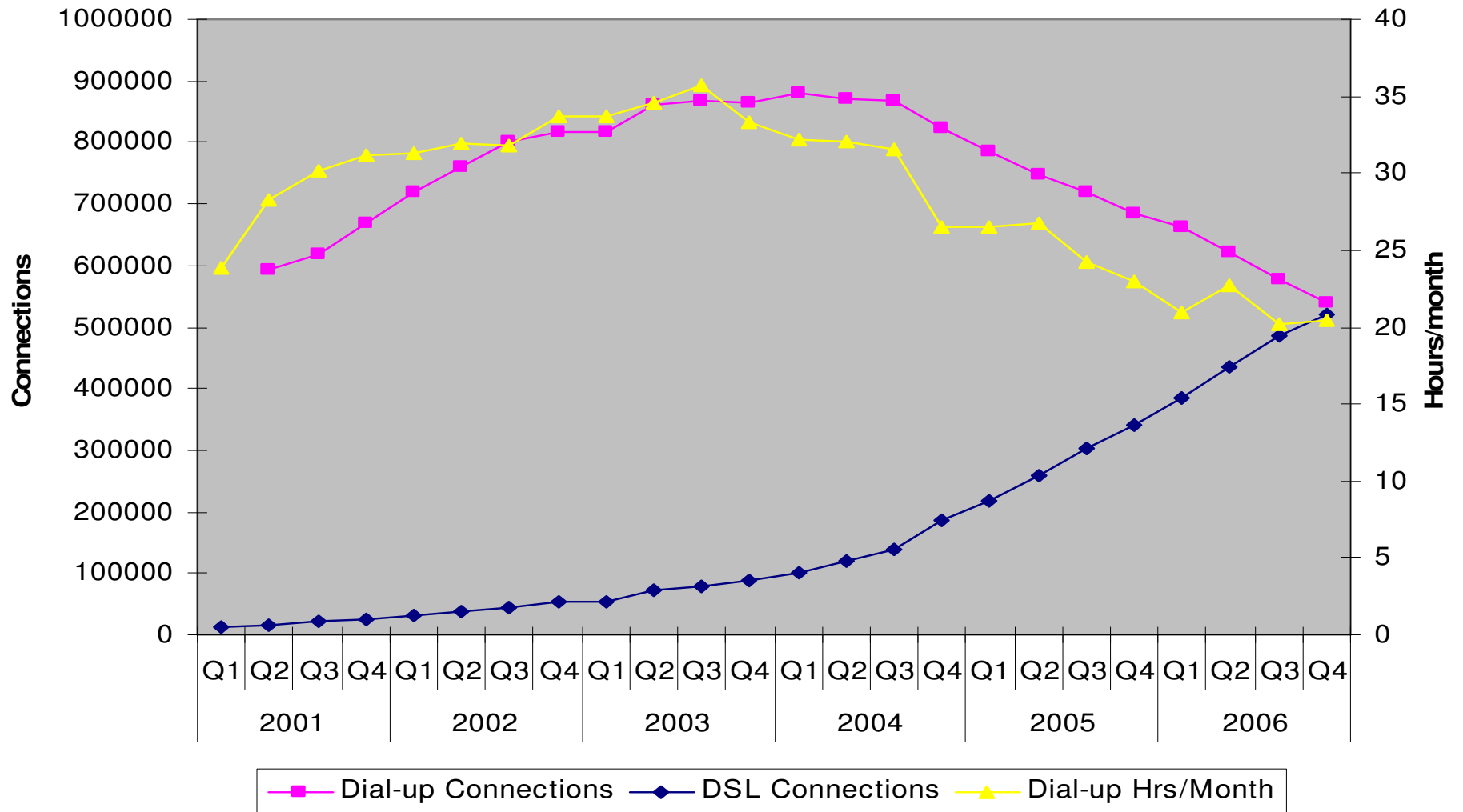
Successful 'light-handed regulation'?

Claim:

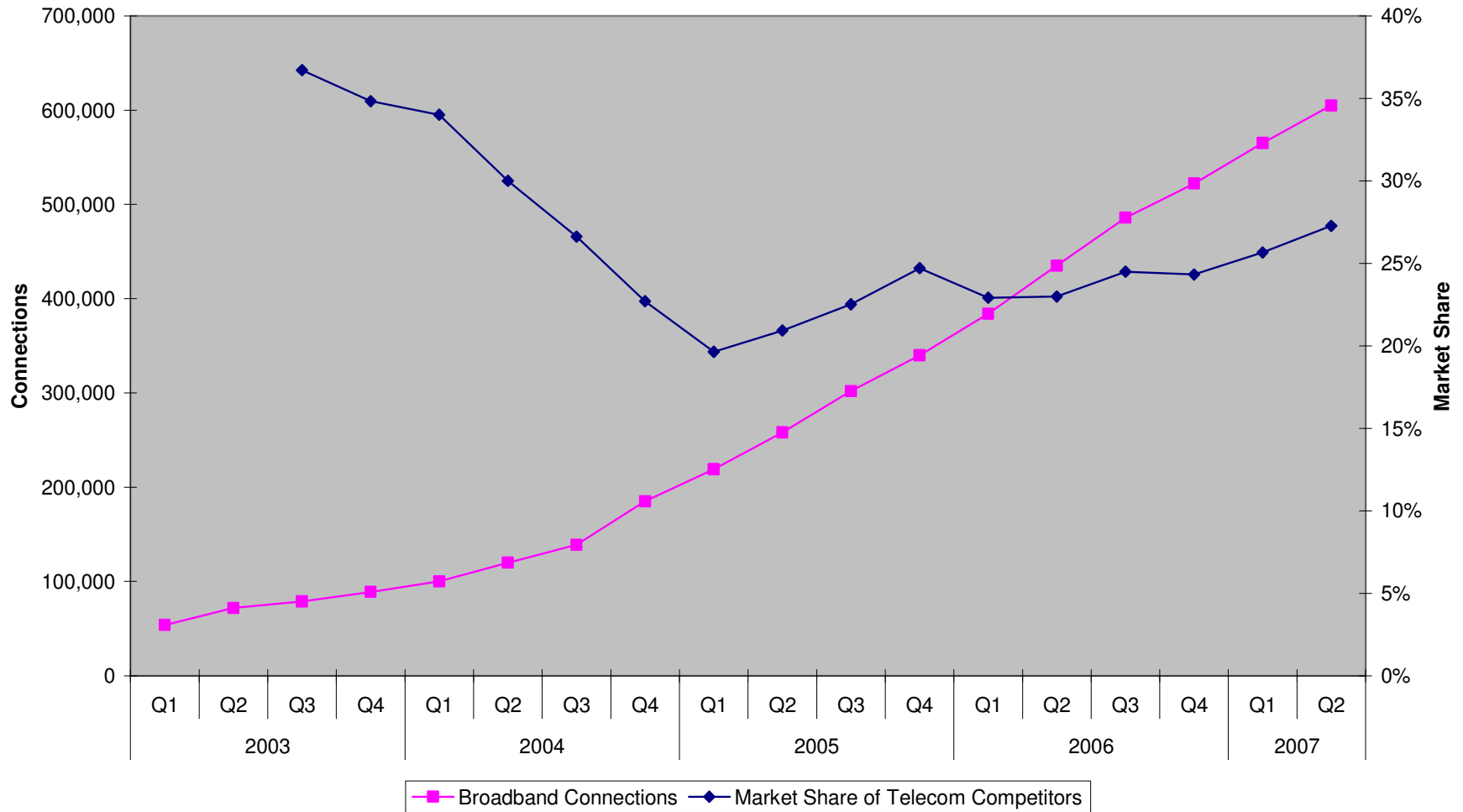
Bitstream unbundling (implemented Q3 2004) increases competition so therefore can be credited with the upswing in broadband uptake from 2004



NZ Internet Market 2000-2006



New Zealand ADSL Market 2003-2007



WHAT *REALLY* HAPPENED

Government accepted recommendation for bitstream unbundling

- but warned Telecom that it must sell a target number of connections by December 2005 of which at least 33% must be 'resold' by competitors
- if targets not reached, regulatory ratchet would be tightened

What incentives did competitors (who really wanted LLU) have to sell bitstream connections?

- the regulated price for bitstream (internationally benchmarked) was only \$2 below the retail price of Telecom's entry ADSL product
- interconnection arbitrage rendered revenues of around \$10 per month on the average dial-up account
- note Telecom had only 50% of dial-up ISP market share



DECEMBER 2005

Telecom 'overshot' the uptake target (by 11%)

- largely courtesy of 'Kevin the Kiwi', Facebook and YouTube

But 'failed' the competition target (only 25% sold by 'entrants')

Continual 'relitigation' of the 'competition problem' based on claims that broadband uptake must be higher still

- full LLU and functional separation implemented in 2006/7
- no cost benefit analysis, regulatory impact analysis or repeat of the extensive 2003 inquiry to support interventions
- main 'evidence' was on a ranking of 1-9 of the main 'suspects' for BBU drivers, the only one where NZ placed either 1 or 9 relative to the top 8 OECD bbu countries was connections sold by entrants;
- plus OECD assertions that LLU would increase both bbu and total sector investment

THE CONSEQUENCE

Dramatic fall in Telecom share price

- credit rating fell, cost of capital rose

Investment stand-off ensued

- Telecom indicated it was prepared to invest only 1/3 of funds required for nationwide FTTN network
- political negotiations led to Telecom making investment undertakings for a network completed in 2011
 - announced around the same time that regulated access price increases were announced

Secured the same network envisaged in 2003

- at a substantially higher cost and deployed significantly later than the original 2007 timetable



DOING NOTHING IS ALWAYS AN OPTION

(Guthrie, 2006)

Valuable when uncertainty is high or policy is irreversible

Offers time to gather more information

The 'bad news principle'

- acting when in hindsight not acting was optimal is more costly than waiting
- it is always possible to do/invest more subsequently to 'catch up'
- but sunk costs/stranded assets remain sunk/stranded



CARTS BEFORE HORSES? THE ULTRA-FAST BROADBAND 'PROBLEM'

Where the application benefits to end-consumers are compelling, and investors can achieve a fair return on their investments, there are few reasons why intervention is required to drive diffusion

- the evidence – mobile telephony

Uptake 'problems' could arise from

- shortage of welfare-enhancing applications
- constraints on investment returns
- as well as infrastructure availability/pricing



HEATLEY & HOWELL (2010)

Except in Japan and Korea, 100Mbps symmetrical is the exception rather than the rule for retail FTTH connections

(Data from OECD, 2009)

Dansk Bredband (Denmark) (kbps)

512/512; 2000/2000; 10,000/10,000; 20,000/20,000; 25,000/25,000;
50,000/50,000; 100,000/100,000

Elisa (Finland)

1000/1000; 2000/2000; 5000/5000; 10,000/10,000; 50,000/50,000;
100,000/100,000

KPN (Netherlands)

30,000/3000; 50,000/5000; 60,000/6000

Verizon (USA)

10,000/2000; 20,000/5000; 20,000/20,000; 50,000/20,000

Generally, fibre priced the same as or below cable, ADSL

- inconsistent with unconditional dominance
- suggests few compelling user benefits (given current applications)



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LOW WILLINGNESS-TO-PAY FOR SPEED

33% of US consumers buy a package with speed faster than their operator's base offering

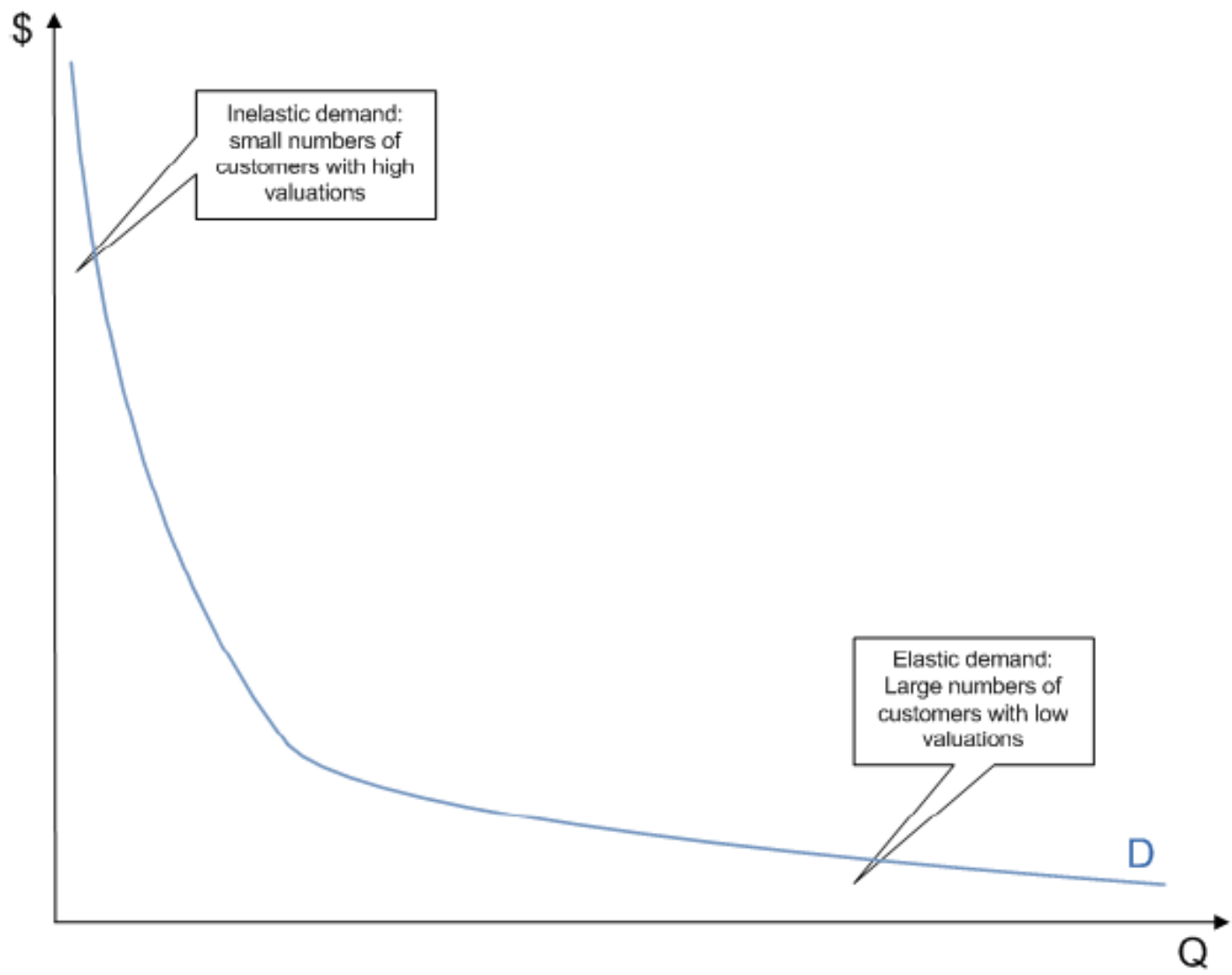
But average price paid is only 1.2 times base speed price

- fastest packages around 7 times standard price

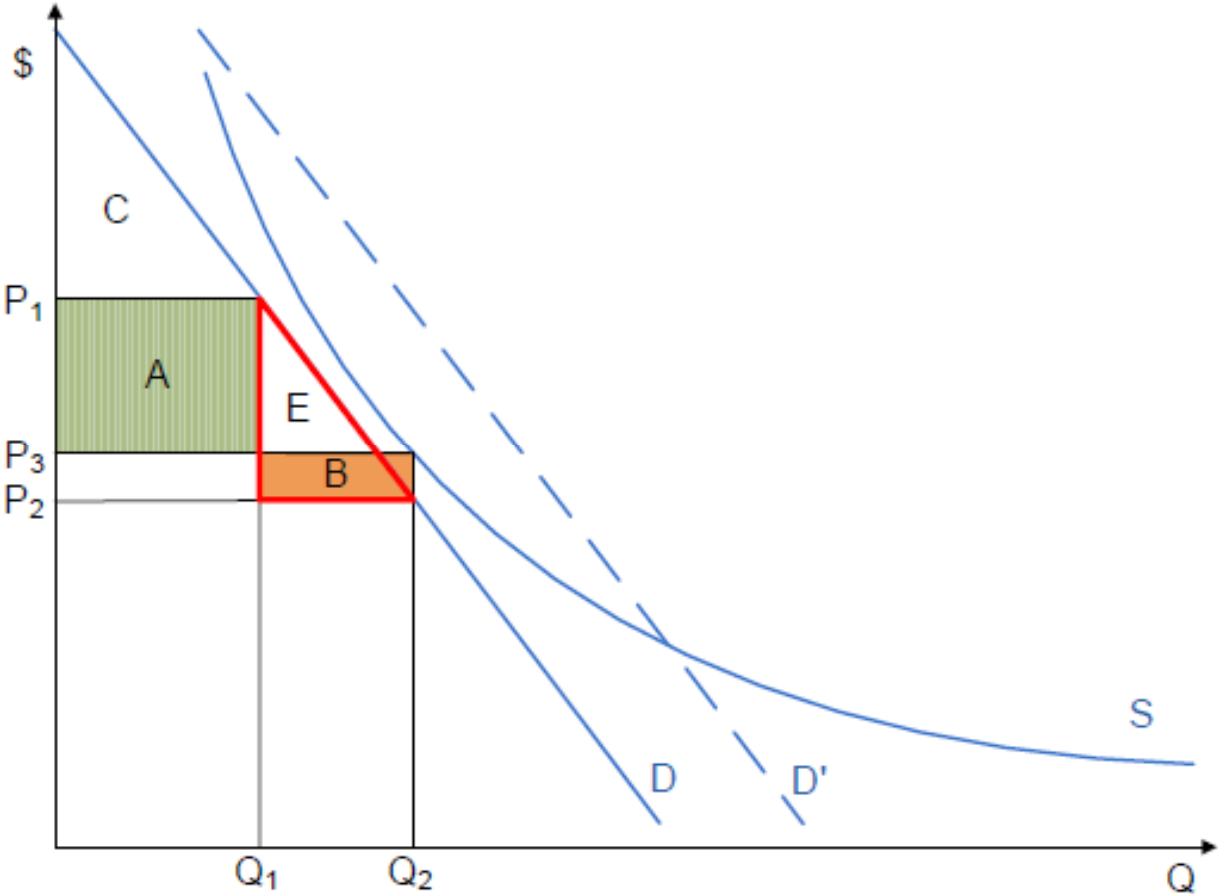
Flat-rate packages militate against substitution to faster connection for price-sensitive customers

- requires valuable application to justify
 - most applications currently quite functional on existing networks
- mobile broadband offers additional value with same application base





PRICE DISCRIMINATION AIDS EARLY UPTAKE



DYNAMIC MARKETS ARE HIGHLY COMPLEX

There is no substitute for understanding both the *underlying industry drivers AND econometric modelling processes*

There may be many ways of explaining observed phenomena

- context matters
- monopolies for policy ideas are still monopolies
 - with all that entails
- contestible processes of assessing the evidence add value
 - provided the judges are sufficiently skilled in both evidence and process



‘FIRST DO NO HARM’

Regulation is never costless

- destroys options for the regulated firm
- creates new options for its competitors
 - new opportunities for strategic gaming
 - competitor welfare is not consumer welfare

Evidence-based policy suggests a cautious approach

- perhaps Health policy has some lessons for Telecommunications policy after all

