

**Review**

# **Howell's Submission on the Telecommunications Amendment Bill**

**Prepared for**

**InternetNZ and TUANZ**

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## Executive Summary

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TUANZ and InternetNZ have asked me to review a paper by Bronwyn Howell<sup>1</sup> prepared in support of her submission to the Finance and Expenditure Select Committee. The submission is strongly opposed to the additional fixed-line regulations proposed in the Telecommunications Amendment Bill. The context requires that this review addresses the academic standard of the paper, and its merits as policy advice. On both criteria, it falls well short of an acceptable standard.

Howell is clearly energetic and passionate about the subject. It may be that these admirable qualities are the root cause of the serious weaknesses in the paper. It is otherwise difficult to understand how she came to blatantly misrepresent the work of others, make statements that would not pass muster in a first year economics course, suggest that her own exceptionally weak empirical work is evidence of anything meaningful, and appear ignorant of her logical errors.

The paper is very long (166 pages) but not strong. It rambles over much of Howell's previous work. References to herself are exceeded in number only by references to the OECD. The length is a substantial weakness, not least because it reveals so much about Howell's approach.

It is clear that Howell is opposed to the measures contained in the Telecommunications Amendment Bill. Three main arguments are advanced in support of this position:<sup>2</sup>

- More broadband uptake will not contribute to economic growth;
- Unbundling may not promote broadband uptake; and
- The proposed measures are out of line with international trends.

None of these propositions can be proven: one can find evidence on both sides. Simple introspection is enough to tell us that the context in each country will be important. If a country had 100% broadband penetration, then the first argument would clearly be correct. On the other hand, there is recent evidence<sup>3</sup> from academics at MIT and Cornell University, reporting to the USA government, that broadband availability (which is a pre-requisite to uptake) has delivered economic benefits in some parts of the USA. The authors have this to say.

*We find support for the conclusion that broadband positively affects economic activity in ways that are consistent with the qualitative stories told by broadband advocates. ... This analysis is perforce preliminary because additional data and experience are needed to more accurately address this important question; however, the early results presented*

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<sup>1</sup> Bronwyn Howell, 2006, Submission: Telecommunications Amendment Bill Presented to the Finance and Expenditure Select Committee.

<sup>2</sup> I phrase the first two as forward looking claims because Howell is opposing the Bill and presenting these as the main pillars of her argument. She uses different words.

<sup>3</sup> S.E. Gillett, W.H. Lehr, C.A. Osorio, and M.A. Sirbu, 2006, Measuring the Economic Impact of Broadband Deployment, Report for Economic Development Administration U.S Department of Commerce.

*here suggest that the assumed (and oft-touted) economic impacts of broadband are both real and measurable.*

The relevant question is not whether more broadband uptake is always good, but whether it would be good for New Zealand. In this context, Parliament would presumably want to interpret “good” in a broad sense, not a narrow economic one. It remains to be seen whether Parliament is as sanguine about poor residential uptake of broadband as Howell, who advances the following as reasons to not be concerned:

- Lack of residential use is not a problem for measured GDP (p46);
- Trademe works OK with dial-up (p50);
- Our GDP per capita is not high (p47); and even
- We like outdoor pursuits (p88).

Setting aside the fact that welfare can increase without GDP increasing, the claim that GDP won’t increase with residential broadband upgrades is at least dubious. GDP can increase whenever a user upgrades to a service with more value added. It is not clear whether Howell doesn’t know this, or whether the source of the error may be her peculiar (and wrong) views about consumer demand for telecommunications services. She claims that residential users will not upgrade to broadband until it is cheaper than dial-up (p86), whereas any economist would predict that as the relative price of broadband falls, more people will upgrade even if broadband remains more costly, as it is a service of superior quality. She makes the same absurd claim (p96) about mobile and fixed line services, which are described as ‘perfect substitutes’. Clearly, they can be substitutes, but the degree of substitutability is far from perfect.

Howell’s freezer ship analogy is a good example of her style. Freezer ships are like broadband in the sense that they are both revolutionary transport technologies, with the potential to transform the economy of transport-dependent countries like New Zealand. Howell makes a great play out of the fact that transport is useless in isolation: it is only useful if there are things to be transported. This makes it very difficult to measure the exact economic contribution of a single freezer ship. The resulting cloud of uncertainty means, according to Howell, that New Zealand might not actually want or need more broadband, and we certainly can’t tell for sure how valuable it is.

The problem for Howell is that freezer ships did actually transform our economy, and broadband might do the same. Rather than confront this reality, or seriously attempt to weigh up the merits of the competing views, Howell loads a scatter gun with every disadvantage she can think of. This goes to the ridiculous extreme of citing, as a detriment of freezer ships, the fact that European farmers found it harder to compete. Again, this claim is ludicrous from an economic perspective: the displacement of inefficient producers through technological advance is a cornerstone of growth in a competitive market economy, and the resources saved are an economic benefit rather than a cost, since they can be put to more efficient uses.

Will unbundling promote broadband uptake? Howell’s headline argument here is that the case is not proven. In support of this claim, she

- Mis-represents work by Network Strategies for the Telecommunications Stocktake;
- Presents a poorly designed and incorrectly interpreted empirical analysis of her own; and
- Conducts a selective literature survey.

When I first read what Howell claims (p66) Network Strategies did, I was surprised and disappointed. The relevant passage from Howell reads:

*The comparison involved “identifying the key characteristics that distinguish the top quartile from New Zealand” (Network Strategies, p 4). The acceptance or rejection of a characteristic being significant was done by ranking the New Zealand statistic alongside the Top 8 country statistics, and rejecting as a possible explanation any characteristic in which New Zealand was not at the extreme. Only if New Zealand ranked 1 or 9 was the characteristic considered to have explanatory power in respect of the difference between New Zealand’s broadband uptake and that of the Top 8.*

If this was the methodology used, there would be merit in the disparaging comments Howell makes about the Network Strategies paper. It is not true. Along the same lines, Howell has a very unfortunate habit of making things look like quotes when they are not. Referring again to Network Strategies’ report, she uses the following terms in single quotation marks: ‘diagnose’, ‘problem’, ‘proof’, and ‘cause’. None of these terms appear in the Network Strategies’ report. By inference, when Howell uses single quotation marks, they mean ‘this is not what was said’.

Howell argues that Network Strategies should have done some regression analysis, and presents some of her own regression work. It is extremely simple, ill-conceived and incorrectly interpreted. It is very far from being the ‘scientific’ analysis that Howell claims it is. Howell’s regressions are simply incapable of discriminating between explanations for broadband penetration because they only test one factor at a time. So she has no basis for her claim that GDP per capita is the most important factor. In an appendix to this review, I report analysis of a style that is capable of comparing alternative explanations. It suggests that GDP per capita is not important for broadband penetration, but regulation is.

Howell deliberately and arbitrarily forced some of her regression models to describe an ‘n’ shape, and then argued that this showed that too much competition could be a bad thing. Ironically, even if one believed this line of reasoning, Howell’s ‘n’ shaped models suggest that New Zealand would get more broadband penetration if competition was more advanced. This inference is not noted by Howell, though she does choose to highlight in some detail results that she knows to have no empirical support at all.<sup>4</sup>

A similarly selective approach is apparent in Howell’s literature review. Chaudhuri and Flamm (2005) do not “conclude that the demographic differences between dial-up and

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<sup>4</sup> See her discussion of a statistically insignificant estimate, between the graphs on page 77.

broadband users are not significant". After observing that this is true for age, race and income, they proceed immediately to say:

*Most of the other variables, on the other hand, do have different coefficient values in determining low speed and high speed purchase decisions. For example, MALE has a negative – though not statistically significant – effect on dialup demand, but has an opposite (and statistically significant) effect on broadband demand.*

Also largely omitted are references that provide any constructive advice about how to regulate for broadband uptake. It is well known that this is difficult to do well, but this does not mean it shouldn't be done. A recent paper by academics from Berkeley and Norway<sup>5</sup> has this to say:

*To make LLU more viable, at least from the entrant's point of view, transaction hazards must be reduced, partly by simplifying and standardizing service provision, partly by designing more entry-friendly regulatory-contractual safeguards, including cost-based pricing. The recent popularity of UNE-P which provides competitors with the ability to essentially obtain resale of local services from "bottom-up" costs rather than at a "discount from retail," and the relatively high DSL unbundling frequencies found in some of the smaller European countries, particularly Norway, may indicate partial fulfilment of at least some of these conditions.*

Howell's third argument is that unbundling is against international trends. Her evidence seems to be that some countries have started to pay relatively more attention to investment incentives for incumbents. Most people will realise that one does not imply the other. The policy imperatives across countries differ according to whether or not they already have unbundling.

In conclusion, this paper is remarkable, in many ways. It is passionate, creative and long, but lacking a concise argument. There are lots of interesting facts but the fabric into which they are woven is spoiled by serious logical and interpretational holes. If I was reviewing it for an academic journal, I would recommend it be rejected.

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<sup>5</sup> P.T. Spiller and S. Ulset, 2003, Why Local Loop Unbundling Fails?

# 1. Howell's Arguments

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It is clear that Howell is opposed to the measures contained in the Telecommunications Amendment Bill. Three main arguments are advanced in support of this position:

- Broadband uptake does not contribute to economic growth;
- Unbundling may not promote broadband uptake; and
- The proposed measures are out of line with international trends.

A vast amount of information is marshalled, ostensibly in support of these arguments. This section presents the supporting arguments as clearly as possible. It is necessarily a selection, because the purpose is to expose the arguments to scrutiny rather than to rewrite the paper. Some of the phrasing is mine. All page numbers are references to Howell's paper.

## 1.1. Broadband uptake does not contribute to economic growth

It is accepted that advances in information and communication technologies (ICTs) deliver economic and social benefits, but those benefits are many orders of magnitude smaller than was expected (p34).

Broadband is just one of many transport technologies. Transport is a very small component of the value of ICT markets (p34) and plays only small role in the contribution of the ICT sector (p32). Transport is an intermediate service, so better transport does not necessarily create wealth.

There is no theoretical or empirical evidence that new transport technologies stimulate the development of new goods that will be commercially viable only because they can be transported via the new methods (p36).

It is inappropriate to measure the sophistication of a country's ICT investment policies...on the basis of a single technology diffusion statistic (p38).

It would be difficult to argue that freezer ships contributed to New Zealand's economic growth (p39) because even with historic information it is impossible to determine the exact dollar contribution to total economic welfare created by each freezer ship (p40). Moreover, freezer ships meant that European farmers could not compete on price and quality, so better transport creates losses as well as gains (p40).

Even if there was merit in counting freezer ships, it should be done through cardinal rather than ordinal measures because diffusion takes time and saturation points vary across countries (pp41-2).

"If broadband targets are a legitimate policy objective, then they must be substantiated by much more focused targets than simply to increase GDP and societal welfare" (p57)

## **1.2. Unbundling will not increase broadband uptake**

Network Strategies, in a report for the Ministry of Economic Development (MED) 'diagnose' a 'problem', obtain 'proof' that competitive dynamics 'cause' poor broadband uptake and propose a 'solution'. This report is "astounding", "inadequate" and "potentially flawed" (pp65-68).

A few simple statistical tests "draw into question the efficacy of the 'competition' diagnosis and the 'unbundling' solution" (p70).

Broadband penetration is highest when new entrant market shares are around 40% to 50%, so "too much competition may actually lead to decreases in broadband uptake" (pp74-77).

However, extensive unbundling in Europe has actually had a negative impact on DSL penetration (p77).

European data have consistently shown no compelling evidence of any statistically significant relationship (p78).

Empirical analysis on United States data generally show that few state-level policies have had any effect at all on broadband uptake (p82).

Market rules that keep costs low but allow firms to earn returns on investment are good for broadband growth (p84).

If the application base does not change, the broadband prices must fall to less than dial up prices to induce users to substitute (p86).

"The relative disadvantage broadband versus low-priced dial-up in New Zealand is very substantial and is not reducing across time" (p87).

## **1.3. But we don't have a broadband problem anyway**

There is no substantial evidence that NZ is lagging the rest of the OECD in respect of the use of the internet for economic and social gain as measured in the commercial use of the technology (p53).

Residential users in New Zealand don't want much data. 80% of people with 5GB caps used less than 2G/month in Feb 2003 and new users will want even less. Demand is heavily skewed, and it would be dangerous for policy development to accommodate the heavy users (p56).

Residential users in New Zealand don't see an economic rationale for broadband, because of substitute access technologies (especially dialup because of free local calling), the ready availability of lots of outdoor activities (p88), lack of applications (p48 para 1), and constrained budgets. But shortfalls in residential usage is not really a problem

“because residential uptake is a consumption measure, whilst GDP per capita is a production measure” (p 46).

The dominance of agriculture and forestry in New Zealand, and the relatively low reliance on FIRE (finance, insurance and real estate) firms may have a depressing effect on business uptake of broadband in New Zealand (p89).

#### **1.4. Summary**

There is no substantial evidence to suggest that, aside from universally recognised income and country characteristics, New Zealand’s broadband uptake is abnormally low. Moreover, empirical evidence suggests that not only will unbundling be unlikely to have a consistently positive effect upon broadband uptake, it is “likely highly costly...in respect of New Zealand’s broadband uptake rate”.

## 2. Broadband and Growth

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The question to be addressed is whether increased broadband uptake is likely to stimulate growth in New Zealand. The question is about causality: will additional broadband uptake create economic growth?

### 2.1. Structure of the argument

Howell tackles the question in four main ways. She

- Downplays the scale of the issue;
- Argues that data transport doesn't do much by itself;
- Questions the metric; and
- Argues that "reverse causality" explains our performance.

#### 2.1.1. Minor scale

Howell starts by ensuring any effect that might exist seems very minor. Broadband is just one of many ICT technologies, and Howell gives the impression that even the whole set of ICT technologies are not very important. She achieves this by comparing the contribution of ICT to the overblown prior expectations of enthusiasts.

*It is accepted that advances in information and communication technologies (ICTs) deliver economic and social benefits, but those benefits are many orders of magnitude smaller than was expected (p34).*

She then notes that ICT markets are much bigger in value terms than broadband markets, the implication being that broadband is hardly worth worrying about.

*Broadband is just one of many transport technologies. Transport is a very small component of the value of ICT markets (p34) plays only small role in the contribution of the ICT sector (p32).*

The value share is irrelevant. Services that deliver a critical part of the value chain are very important, even if they only have a minor value share. The value of the chain as a whole depends on the functioning of all of its parts. To take a fictitious example, a company with a monopoly over telephones would be in a very powerful position, even though the cost of phones is small relative to the cost of telephone services as a whole.

#### 2.1.2. Transport is not important by itself

Next follows the argument that transport services as a group cannot do much to stimulate an economy. There is a semi-valid point in here, which is that transport services are only beneficial if people want to use them. Howell extends this rather obvious point to an absurdity in this quote

*There is no theoretical or empirical evidence that new transport technologies stimulate the development of new goods that will be commercially viable only because they can be transported via the new methods (p36).*

This is demonstrably false. The internet is a transport technology. It has stimulated the development of new goods (podcasts, ebooks) and services (online advertising, trademe) that are commercially viable only because they can be transported via the new methods. In addition to new economic goods and services, the availability of this transport technology has opened up many new avenues for communication such as email, instant messaging and blogs. While the economic impact of these new forms of communication would be difficult to measure, they have almost certainly contributed significantly to an increase in welfare.

Howell's transport argument deteriorates further in the freezer ship analogy. Freezer ships have apparently been likened to broadband in their potential to transform the New Zealand economy. In attempting to debunk this view, Howell presents some very odd arguments indeed.

*The nexus between the number of freezer ships and economic growth is very difficult to draw... (p39). Even with historic information it is impossible to determine the exact dollar contribution to total economic welfare created by each freezer ship (p40).*

This may all be true, who cares? Why would we want to estimate the marginal impact on growth of a single ship, or a single broadband connection? The real issues are (a) whether there is currently a market failure in respect of the provision of broadband services and (b) whether unbundling will make things better or worse. It is not necessary to know the marginal growth impact of another broadband connection to answer those questions.

Howell's final attempt to link broadband with transport, and therefore to paint it as being of dubious value, comes towards the end of page 40, where she argues that

*Freezer ships meant that European farmers could not compete on price and quality, so better transport creates losses as well as gains (p40)*

What is the implication here? That it might be bad for commercial rivals of New Zealand firms if we get more competitive as a result of better broadband? And that we should care? Even if one's objective was to promote global welfare rather than New Zealand's welfare, Howell would be wrong on economic grounds. Freezer ships were a net benefit, because they allowed European consumers to get a better deal: either the same product more cheaply, or a better product for a similar price. The resources saved in this case include ones supplied by European farmers. Those resources are no longer needed for meat and butter production (or not to the same degree) and can be diverted to alternative uses. More fundamentally, the displacement of inefficient producers, and the threat of displacement, is one of the best features of a market economy.

### 2.1.3. Measurement Issues

Howell also objects to the way performance should be assessed:

*It is inappropriate to measure the sophistication of a country's ICT investment policies...on the basis of a single technology diffusion statistic (p38).*

*Even if there was merit in counting freezer ships, it should be done through cardinal rather than ordinal measures because diffusion takes time and saturation points vary across countries (pp41-2).*

The point seems to be that broadband penetration data relative to other countries is either not relevant or insufficient by itself to represent progress towards a reasonable policy goal. These are highly debatable points.

In my view, fixed line broadband uptake levels are reasonable policy targets. Substitutes for fixed wire broadband, and the uses to which broadband services are put, are both considered by end-users when they make subscription decisions. This does not make broadband uptake an unreasonable policy objective, or require analysts to conduct extensive surveys of substitutes and applications however. Broadband uptake is a reasonable policy objective because it indicates the extent of diffusion of a frontier technology. The only reason to delve deeper is to see whether poor performance should be accepted because of other factors.

Cardinal measures are vulnerable to exactly the same criticism Howell levels at ordinal measures, so no case has been established for switching target definitions. Ordinal measures indicate our progress on diffusion relative to other countries, whereas cardinal measures indicate progress towards complete diffusion. But if New Zealand's optimal diffusion rate is less than 100% (as Howell suggests), we would need to know that optimal rate before any purpose would be served by adopting a cardinal measure. Otherwise, we have no yardstick against which to measure our performance, and the cardinal measure is essentially useless. The value of ordinal measures is that they give an automatic yardstick – our performance relative to other countries.

The substance of Howell's measurement argument is further obscured by the following quote from her summary section.

*"If broadband targets are a legitimate policy objective, then they must be substantiated by much more focused targets than simply to increase GDP and societal welfare" (p57)*

Leaving aside the question of how one might "substantiate" a target, this statement is very odd. Performance an ordinal broadband policy target is not assessed against increases in GDP or societal welfare. It is done by comparing our broadband penetration with those of other countries. Furthermore, we would hope that increasing GDP and social welfare are the primary overall objectives of most government policies.

#### 2.1.4. Reverse Causality

Howell presents a fairly weak argument (section 1.5.2) that “reverse causality” explains our poor broadband performance. Observing a seemingly strong positive correlation between broadband uptake and GDP per capita in OECD data from December 2005, she claims that

*Most of the difference between New Zealand’s broadband uptake and that of other OECD countries occurs as a consequence of differences in GDP per capita (p47).*

There are two problems with this. Firstly, it confuses correlation with causality, and thereby ignores the best known caution from the extensive econometric and philosophical literatures on causality. For example, the fact that two people have similar (correlated) shopping habits does not imply any causal relationship.

Secondly, GDP per capita does not have the primary role in explaining broadband penetration Howell ascribes to it, once other factors are considered. The appendix presents cross-country multiple regression models in which regulation and urbanisation variables provide statistically significant explanations of broadband penetration. GDP per capita is at best marginally significant in these models. Howell’s approach of considering a single factor at a time in terms of its ability to explain broadband penetration is fundamentally flawed. This type of approach ignores any more complex relationships that may exist between broadband penetration and potential explanatory factors. It is nowhere near the standard required of a “scientific” analysis that Howell claims it to be.

## 2.2. What others say

Contrary to Howell’s ‘flawed assumption’ claim, broadband uptake is generally viewed as a driver of economic growth. The primary mechanism is that broadband increases the productivity of firms by allowing workers to work faster, do new things, and communicate more efficiently. For example a recent case study in Canada<sup>6</sup> concluded that

*“...whether broadband connectivity is resulting in increased business income or simply allowing businesses to maintain income, broadband has become an important factor in allowing businesses to remain competitive.”*

Similarly, the opening passage in the Criterion Economics report that Howell quotes (p.78) with approval says

*Broadband brings substantial benefits for the European economy. Unlike traditional narrowband connections, broadband provides high speed, always-on connections to the Internet and supports innovative content and services. Direct consumer welfare gains from mass market adoption of broadband across the EU could easily reach 50 billion*

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<sup>6</sup> [http://largebande.gc.ca/pub/program/case\\_studies/sfu/index.html](http://largebande.gc.ca/pub/program/case_studies/sfu/index.html)

*euros or more per annum. As an input into many other sectors of the economy, broadband is an enabler of the information society, increasing productivity and competitiveness.*

These passages are consistent with the general view that there are economic benefits available from broadband uptake. Of course there are limits to the benefit of expanding broadband availability, such as into places that have no electricity, or places that already have multiple forms of broadband access. But these are exceptions to the general fact that broadband does have economic benefits.

Exceptions arise from location-specific factors. Howell proposes many factors as reasons for New Zealand's poor broadband performance: cheap dial-up, lack of applications, constrained budgets, the fact that we like outdoor activities. However, she appears to have no interest in quantifying their impact.

Howell's empirical analysis never gets beyond simple correlations between pairs of variables. As a result, she cannot say anything about how important certain factors are, relative to others. This is unfortunate given her obvious passion for the subject and the privileged access she has previously had to Telecom's data. It also leaves the reader wondering why serious empirical analysis is missing, when so much other work was undertaken.

A good example of what could have been done is provided in a recent report for a US government agency by Gillett *et al* (2006).<sup>7</sup> This paper uses zip code level data to examine the relationship between broadband availability and several economic measures. Importantly, this work controls for the context (ie the characteristics of each locality) using a multiple regression model.

On the substantive issue of broadband's economic impact, Gillett *et al* have this to say.

*We find support for the conclusion that broadband positively affects economic activity in ways that are consistent with the qualitative stories told by broadband advocates. ... This analysis is perforce preliminary because additional data and experience are needed to more accurately address this important question; however, the early results presented here suggest that the assumed (and oft-touted) economic impacts of broadband are both real and measurable.*

The Gillett *et al* paper is one of the first of its kind, and was limited by data constraints to studying broadband availability rather than take up. However it is consistent with what theory predicts: that broadband increases productivity, which is good for economic growth.

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<sup>7</sup> [http://cfp.mit.edu/groups/broadband/measuring\\_bb\\_pp.html](http://cfp.mit.edu/groups/broadband/measuring_bb_pp.html)

### **2.3. The New Zealand Situation**

The substantive question for policy makers is whether to work on the assumption that more broadband is good for New Zealand or not. In this context, 'good' should be thought of as a generalised measure of welfare, certainly broader than measured GDP.

Howell has documented many aspects of New Zealanders' internet usage, and appears to consider that we are relatively heavy users of internet functionality. However she thinks policy makers should have no concerns that consumers are not upgrading much of this activity from dial-up to broadband. A range of factors are discussed (pp.53-58) as reasons to think there is not a policy problem.

One contributing factor is missing from Howell's otherwise extensive list: the price of broadband.

## 3. Unbundling and Broadband

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The second leg of Howell's argument is that unbundling will not stimulate broadband uptake. This involves:

- criticism of a Network Strategies report;
- regression analysis; and
- a literature review

The most interesting part of this section of Howell's report is her own regression analysis. As will be explained below, the models used in Howell's figures 2.4, 2.5 and 2.7 are highly questionable from an econometric standpoint. Interestingly however, they also flatly contradict Howell's assertion that unbundling in New Zealand will not stimulate broadband uptake. They show 'optimal' levels of competition which are well above those currently experienced in New Zealand.

### 3.1. Network Strategies report

A reasonable standard of proof is required before embarking on policy interventions of the type proposed in the Bill. Howell argues that the Network Strategies report fails that test badly. In doing so, she mis-represents the purpose of the Network Strategies report and its content.

#### 3.1.1. Purpose

Howell implies that Network Strategies' study was intended to discover whether there was a competition problem in the New Zealand broadband sector. If that was the purpose, then Network Strategies would indeed have failed, but it was not. The purpose was to study how New Zealand could achieve a 'competitive international ranking' in broadband.

#### 3.1.2. Content

Howell describes a methodology she says Network Strategies used to determine which factors distinguish New Zealand from the top OECD quartile. It rejects all factors unless New Zealand ranked 1 or 9 relative to the OECD top quartile. This sounds a very poor method indeed. However it does not appear to be what Network Strategies actually did.

Indeed, there is not much difference between the methodologies of Network Strategies and Ms Howell. Both present and discuss data on a range of factors relevant to broadband uptake in different countries. Neither undertakes any serious econometric analysis of those data with a view to assessing which matter, or matter most. Both draw inferences in a relatively casual (ie informal) way from the data they present.

Howell uses what look like quotes from Network Strategies, but are not. The words 'diagnose', 'problem', 'proof', and 'cause', which appear with single quotation marks on pages 66-68 of Howell's paper, do not appear in the Network Strategies report.

### 3.2. Howell's Regression Analysis

Howell makes the following claim after presenting her regression analysis:

*Altogether, these findings suggest that there is very little empirical substance to the claim that European Union unbundling policies have been responsible for the increasing levels of broadband uptake exhibited in these countries, or that the effect of unbundling is becoming more significant across time.*

Several points need to be made in response. First, the preceding analysis is extremely simplistic. It consists entirely of a set of bi-variate regression models, and is therefore simply incapable of discriminating between alternative influences on broadband uptake. The appendix shows how the relative influence of different factors can be assessed.

Second, the specification of the models appears completely arbitrary. A good example is figure 2.5, in which the quadratic function is clearly being heavily influenced by one observation in the bottom right of the graph. No attempt has been made to assess just how influential that data point is, though a range of econometric methods are available for such purposes.<sup>8</sup>

Finally, but most surprisingly, if Howell thought a little more carefully about her own quadratic models, she would be obliged to either deny their merit, or conclude that more competition would be good for broadband penetration in New Zealand. All of those models suggest that penetration is highest when entrants have 40% to 50% market share. New Zealand has around 25%.

### 3.3. Howell's Literature Review

In the time available, it was not possible to delve extensively into Howell's literature review. However it is clearly not a survey, in the sense that publications in the Journal of Economic Surveys are surveys. The papers quoted are a selection, and they are also cited selectively.

For example, contrary to Howell, Chaudhuri and Flamm (2005) do not "conclude that the demographic differences between dial-up and broadband users are not significant". After observing that this is true for age, race and income, they proceed immediately to say:

*Most of the other variables, on the other hand, do have different coefficient values in determining low speed and high speed purchase decisions. For example, MALE has a negative – though not statistically significant – effect on dialup demand, but has an opposite (and statistically significant) effect on broadband demand.*

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<sup>8</sup> Belsley, D., E. Kuh, and R. Welsch, Regression Diagnostics, Wiley, 1980

## 4. Minor Points

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1. Diffusion of technologies in markets does not universally follow an 'S-shaped Gompertz curve' (p41).
2. It is not necessarily good that TradeMe has been forced to design its site to suit low bandwidth constraints (p50). Without this constraint, the website may have been able to have additional features that would make the TradeMe business more profitable.
3. It is also not necessarily a positive sign that New Zealanders exhibit high hours of dialup usage per month (p49). Since dialup connections are slow, this may mean that people are spending a lot of time for relatively little benefits.
4. To claim a 'finding' that competition between technologies matters more than competition by new entrants for determining broadband uptake (p75/76) based on the results of two simple and arbitrary regressions strains all academic credibility.
5. It is not necessarily the case that 'small amounts of data transported mean that data caps are unlikely to be a significant brake' (p81). The small amounts of data transported may occur simply because of the existence of data caps. Even if Internet users do not regularly exceed their cap, the simple presence of a cap may affect their behaviour and reduce their usage.
6. It is not true that the time savings from broadband are relatively small, even at small data volumes (p86). Suppose a user transfers 1.5GB per month. At a dialup speed of 5KB/s this will take approximately 87.5 hours to transfer. At a broadband speed of, say, 100KB/s, this will take approximately 4.5 hours to transfer, a saving of around 83 hours per month.
7. It is false to suggest that a lack of use of online gaming in New Zealand stems from the fact that New Zealanders do not value playing online games (p87). It may simply be the lack of access to broadband Internet that is constraining people's enjoyment of games.
8. Mobile and fixed line telephony are not perfect substitutes (p96). If they were, all users would take the cheaper service regardless of any other qualities.
9. It is incorrect to claim that 'inter-platform competition is regulatory first-best' (p113). The term 'first-best' has a specific meaning in economics and refers to a situation where the maximum possible level of economic welfare is reached in a market. Generally this requires that retail prices equal marginal costs. Simply promoting inter-platform competition will not typically be sufficient to achieve this.

## Appendix: Regulation and Broadband Uptake

To investigate alternative explanations of broadband penetration, the data set shown in Table 1 was compiled using information from various sources. This was used in a multiple regression framework to investigate the factors that drive broadband penetration. This analysis is illustrative only: no claims are made as to its sufficiency for answering the question of what drives broadband uptake. However it demonstrates a method that has a much better chance of discovering the important factors than the Howell method.

**Table 1** Broadband Drivers Database

	BB	Reg	GDP	UP	SS
Austria	14.1	40	32700	68	19.6
Belgium	18.3	45	31400	98	8.8
Czech Rep.	6.4	12.5	19500	75	3.1
Denmark	25.0	45	34600	85	31.2
France	15.2	52.5	29900	76	6.2
Germany	13.0	25	30400	88	16
Greece	1.4	17.5	22200	61	2.5
Hungary	6.3	32.5	16300	65	2
Ireland	6.7	30	41000	60	30.1
Italy	11.9	42.5	29200	67	3.4
Netherlands	25.3	27.5	30500	90	22.2
Poland	2.4	15	13300	63	1.5
Portugal	11.5	27.5	19300	68	4.2
Spain	11.7	42.5	25500	78	6.7
Sweden	20.3	32.5	29800	83	31.5
UK	15.9	47.5	30300	90	34.3
New Zealand	8.1	14	25200	86	41.3

The following definitions apply:

- BB = Total broadband connections per 100 inhabitants, December 2005 (OECD);
- Reg = ECTA broadband regulatory scorecard, April 2006, with NZ added manually;
- GDP = GDP per capita in \$US, converted using PPP rates, from CIA;<sup>9</sup>
- UP = % of total population in urban areas, from World Bank;<sup>10</sup> and
- SS = References to secure servers per 100 inhabitants, Howell Table 1.3.

The ECTA regulatory index value for a country is the sum of the country scores on the eleven issues shown in Table 2. Each criterion is assigned a score between the values of zero and five, and the scores are added. Since ERG has not assessed New Zealand, a score was assigned manually. Varying this score between 10 and 20 did not materially alter the results discussed below. Neither were the results sensitive to omitting New

<sup>9</sup> <https://www.cia.gov/cia/publications/factbook/rankorder/2004rank.html>

<sup>10</sup> [http://devdata.worldbank.org/wdipdfs/table3\\_10.pdf](http://devdata.worldbank.org/wdipdfs/table3_10.pdf)

Zealand altogether (ie the same models explain the ECTA data with or without the addition of New Zealand).

**Table 2** ECTA Broadband Scorecard Criteria

Criteria
Availability of full ULL and shared access
Comparison LLU tariffs for full ULL
Comparison LLU tariffs for shared access
Are associated facilities (such as co-location) also subject to regulation?
Number of unbundled lines as a percentage of total DSL lines
Availability of SLAs for LLU
Connectivity options for ADSL wholesale on ERG classification
Percentage of DSL lines provided by SMP operator's downstream operation
Do w/sale broadband products include an SLA
Restrictions on migration from a resale ADSL offer to bitstream to ULL
Power to apply price squeeze test and review discriminatory access to wholesale services and the way in which the regulator has effectively applied this power.

The ability of these data to explain broadband penetration was analysed using the well known general-to-specific methodology for model selection. All explanatory variables were included in the first instance, and (statistically) insignificant variables were deleted sequentially, starting with the least significant. The results are shown in Table 3.

**Table 3** Regression Results

	Model 1		Model 2		Model 3	
	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value
Reg	0.186	0.073	0.170	0.048	0.229	0.005
GDP	0.000	0.402	0.000	0.102		
UP	0.314	0.008	0.329	0.003	0.355	0.002
SS	0.039	0.735				
Constant	-22.657	0.008	-24.086	0.002	-22.007	0.003
R Squared	0.701		0.698		0.664	

In model 1, the only statistically significant variables are regulation and urban population share. Secure server calls are the least significant (highest P-value) so it gets deleted first. Model 2 has a lower R<sup>2</sup> value than model 1, but it is a better model because the irrelevant variable (SS) has been excluded.<sup>11</sup> GDP is almost significant at the 10% level in model 2. Model 3 shows that 66% of the variation in broadband penetration can be explained by just two variables: regulation and urbanisation. Note that all of these models explain substantially more broadband penetration variation than any of Howell's models.

<sup>11</sup> Howell gives the quite erroneous impression that maximising R<sup>2</sup> is what matters in regression analysis.