Addendum Response to the Select Senate Committee on the National Broadband Network

Concrete Examples about Australia's Telecomms Infrastructure in Relation to the

Theory of the Second Best

and its Impact on the NBN

By

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Primarily for:

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Introduction

In my opening address to the Select Senate Committee Hearing in Canberra on the 20th July 2009, I made reference to the "**Theory of the Second Best**", and it later became obvious to me that although the Senators were very well versed in the Competitive Regime and its benefits, they appeared totally unaware of the Theory of the Second Best, which I outlined as follows:

*"In 1956 two Economists, Australian-American Kevin Lancaster and Canadian Richard Lipsey came up with the "**Theory of the Second Best**" which in simple English states that **"when businesses work in synergy, then this will always give the most efficient outcome for the economy"**, or putting this in a more brutal form **"the privatised / competitive regime is clearly a very poor Second Best choice compared to any synergetic infrastructure regime".** The Cold War was in its throes when this theory came out and economics lecturers found this theory 'very difficult' to teach in this political climate, so this theory has sat quietly for several decades."*

During the giving of evidence, it became very clear to me that without a very simple worked example about a real situation, it was virtually impossible to demonstrate how this "Theory of the Second Best" works, and why this economic theory is so critical in light of the NBN infrastructure proposal and the consideration that the NBN is to be privatised (into the competitive regime) in about five years time.

This "Theory of the Second Best" needs to be understood in practice by the Senators and those that work with them and the Productivity Commission, because like all theories, they are rather vague until a real example shows what really goes on.

This short paper shows how the competitive regime is a very Second Best strategy compared to the infrastructure regime. Each of the headings below demonstrates with rather simplified accounting just how grossly inefficient the competitive regime really is. Australia can be far more productive if it uses the infrastructure regimes' synergetic approach for installing and operating infrastructure, while leaving the retail reselling to the competitive regime.

The Competitive HFC Rollout

Background

In about 1995, Telstra and Optus both installed Hybrid Fibre Coax (HFC) Customer Access Network (CAN) in robust competition with each other so as to get the lions' share of the metro Pay TV market. The competitive scoring was done on the basis of the 'number of homes passed', with the highly incorrect assumption that all these homes that were 'passed' could be 'connected', and so 'homes passed' therefore related back to the sales market potential for the take-up of Pay TV and the ongoing revenues from this product.

It is generally agreed that Telstra paid about $2.5 Bn and Optus paid about $2.2 Bn for this duplicated infrastructure to be installed and commissioned in the Australian metro areas, and that there was an 85% overlap in this geographic duplication. So thanks to the competition regime, we now have an 85% duplicated HFC Pay TV CAN with its associated exchange based equipment and the associated backhaul infrastructures, together with their duplicated headend equipment, and very conservatively this all cost $4.7 Bn in 1995.

Increased Project Costs

Both Telstra and Optus rushed their infrastructures into service in robust competition between each other, so engineering, technical and field staff worked six and seven days a week for extended overtime to get this infrastructure in before their infrastructure competitor.

What is not well publicised is that when project time is shortened, the overall costs escalate at a much faster than linear rate. It would be very conservative to assume that with the extended overtime and work days that the labour costs were increased by 1.2 times (6 days per week including overtime compared to 5 days per week without overtime), and that these costs rise at about the square of the labour costs or about 1.44 times in this case.

Similarly, when it comes to purchasing equipment with a shortened time frame, this situation loses much of the substantial discounts that can be arranged with large bulk sales. In this rushed scenario, telecomms equipment manufacturing companies (like Cisco, Magnavox, Ericsson, Alcatel, Siemens, Nortel, Pirelli, NEC, etc., have to operate their manufacturing lines under a far greater stress to provide the peak orders on a much tighter time schedule. In this environment equipment prices can easily be over 50% greater than the standard programmed purchasing discounted prices that would be normal by waiting a few months.

In round figures, these time-constrained extra costs due to competition easily put the project budget in the order of 50% over budget, and if this is factored into both the Telstra and Optus released project costs, then ***the project costs <u>without competition</u> would have been***:

Telstra = $2.5 Bn should have been $2.5 Bn / 1.5 = **$ 1.67 Bn**
Optus = $2.2 Bn should have been $2.2 Bn / 1.5 = **$ 1.47 Bn**

So if neither of these infrastructures were competitively rushed into service (as they were in reality), then the grouped total project costs **<u>without competition</u>** would have been about **$3.14 Bn and not $4.70 Bn a <u>saving of about $1.56 Bn</u>**, and the customers would have had a better service standard, but the project would have taken 18 months, not in 12 months.

The inefficiencies due to the competitive regime in this case cost Telstra about $833 M and cost Optus $733 M, a total of $1,566 M in getting the equipment installed, and commissioned under the competitive regime approach, which was clearly the Second Best strategy.

Geographic Overlap

Both the Telstra HFC and Optus HFC networks and their associated edge equipment and backhaul are ‘competitive infrastructures’, covering the same geographic metro areas with a nominal 85% overlap, so these HFC CANs are different in size by about 15%, where one is larger than the other – or looking at in another light; one covers an area of 15% where the other one does not.

Looking back at the overall costs, Telstra = $2.5 Bn and Optus = $2.2 Bn, and Telstra has the slightly larger footprint. In comparison Optus / Telstra = $2.2 Bn / $2.5 Bn = 0.88, and this comparison of project costs has a very close alignment to comparative geographic network coverage, proving that both projects were operated in virtually the same manner and ‘efficiency’! But in reality how efficient was all this?

As a duplicated network is entirely unnecessary, this means that if the Telstra HFC network and associated backhaul were to be taken as the base requirement, then the Optus investment of $2.2 Bn is a wasted investment. Alternatively if the Optus HFC network and associated

backhaul were to be taken as the base requirement, then the Telstra investment of $2.2 Bn is a wasted investment, and a further $300 M is required to bring this network up in size enough to cover the full metro coverage.

So no matter which way this is approached, the competitive regime is the prime cause for the network to be duplicated. The cost of the full duplication would be in the order of $2.5 Bn, but Optus stopped short of a full duplication at $2.2 Bn and so the effective wasted investment due to the ***competitive regime*** is $2.2 Bn, ie 22/47 = ***47% wasted revenue***.

With the infrastructure regime approach this HFC CAN and associated backhaul network is wholesale rented to both Telstra and Optus who in turn competitively retail this network to their customers, and the customers have the choice of their Pay TV provider from the same infrastructure.

In this case there would be HFC CAN infrastructure with associated backhaul costing only $1.67 Bn and considering that the competitive regime approach cost for the lesser HFC infrastructure cost $2.2 Bn, then the real wasted revenue is $2.2 Bn in a total of $3.87 Bn, which is ***132% wasted revenue*** thanks entirely to the much lower productivity of the ***competitive regime*** as a poor 'Second Best' strategy compared to the infrastructure regime.

In this 85% duplicated network case, the competitive regimes' productivity is a mere 36% that of the infrastructure regimes productivity figure.

If this competitive regime strategy were taken further so that both Telstra and Optus had 100% duplicated coverage, then the financial cost for either Telstra or Optus would have been $2.5 Bn each – or $5.0 Bn in total from the telecomms industry for that period. The ***competitive regime business would have wasted $3.33 Bn*** as the infrastructure regime cost for the single network would have been only $1.67 Bn, showing that the competitive regime costs about 199% extra than the infrastructure regime, and this clearly shows that the competitive regime is really a very poor 'Second Best' strategy.

In this fully duplicated network case, the competitive regimes' productivity is a mere 33% that of the infrastructure regimes productivity figure.

Geographic Coverage Comparison

Assuming (for simplicity) the Telstra geographic footprint covers say 10,000 sq km, and as there is an 85% overlap, then by deduction, Optus has a 10,000 * 0.85 = 8,500 sq km equivalent geographic coverage.

With the competitive regime model, the total area covered is 10,000 sq km and the overall cost is $4.7 Bn, or approximately $470, 000 per sq km.

With the infrastructure model, because the two infrastructures are not in competition against each other, they cover different areas, so the total area will be 18,500 sq km, and the total cost will be $3.14 Bn (not $4.7 Bn as in the competitive regime), so the cost per unit area for the infrastructure regime model will be $3.14 Bn / 18,500 sq km = $170,000 per sq km

Competitive Regime model	**$470,000 /sq km**	**(276% base cost)**
Infrastructure Regime model	**$170,000 / sq km**	**(100% base cost)**

So the infrastructure regime model is 176% more economic (more productive) than the competitive regime model, or looking at this the other way around, the competitive regime model is at least 64% less economic (less productive) than the infrastructure regime model.

Both productivity figures mean the same, and the difference in productivity is no less than astounding – so where has the Productivity Commission been all these years? Why has the Productivity Commission not picked up on this glaring inefficiency scenario?

Competitive Mobile Phone Networks

Engineering Insight

Mobile phones all work on a set of common radio frequencies. Every mobile phone searches for a parent mobile base station, which then relays the phones' details to a common database for confirmation. The mobile phone is connected to the radio base station that provides the strongest reception, and is part of that mobile providers network. Mobile network providers can pass mobiles onto each other's base stations to provide virtual geographic network coverage by 'competitive' networks.

In a very similar fashion to the HFC example above, each mobile base station is also part of the CAN and has a radio or fibre optic point-to-point communication link back to the district telecomms facility, where the signalling is then relayed back to the common database, and where the nearby radio base stations poll the mobile and decide on the best radio link.

Competitive Regime Situation

It should be obvious from the above engineering insight that only one mobile phone radio network is necessary, and that this network is in effect 'open access' so that any (virtual) mobile phone network retailer could have their phones appear as though they are on this common network with their own logo etc.

Australia has a number of competitive infrastructure mobile radio networks working different parts of the electromagnetic spectrum to optimise on the population density in various geographic areas.

If we take the situation where there are two mobile radio networks with equal geographic coverage, and these networks were installed and commissioned on a schedule that did not involve overtime and shift work, then this is as near to a perfect arrangement for any competitive regime as possible.

Assuming that each network cost $1 Bn to install and commission then the total cost for the mobile networks will be $2 Bn. When competitive networks are commissioned, they operate at typically between 30% and 60% occupation, so their network occupation is typically 45%. So in this situation we have invested $2 Bn at 45% making the total investment worth about say $0.9 Bn. Keeping in mind there are two managements, two maintenance and two sets of overheads, and that is ***anything but high productivity or high overall business efficiency***.

If this network was commissioned under infrastructure guidelines, then there would be one network that cost $1 Bn, and its occupancy will be in the order of 90%, so the value of this investment will be $0.9 Bn. These customers would be none the wiser as they would have their personal logo on their mobile, and they would have network connection as before (but blackspot areas would be a priority issue for the infrastructure regime, so the overall coverage would be far better, and the chance of network congestion would be far lower than if this infrastructure was operated by the competitive regime).

The table below extends this theory for more competition, and it is very easy to see that as the number of infrastructure competitors is increased, the Unit Access Network cost rises very quickly. Nominal Productivity quickly falls away in line with market share, proving that the

competitive regime is a very poor ‘Second Choice’ strategy compared with the infrastructure regime strategy for providing mobile radio networks.

	Infrastructure Networks	Total Infrastructure Cost	Unit Access Network Cost	Nominal Productivity
Infrastructure Regime	1	$1 Bn	$50	100%
Competitive Regime	2	$2 Bn	$100	50%
Competitive Regime	3	$3 Bn	$150	33%
Competitive Regime	4	$4 Bn	$200	25%
Competitive Regime	5	$5 Bn	$250	20%

The obvious argument is that each competitive network will not have full geographic coverage, but will concentrate on say the high-density populated cities (because that is where the high revenue is). This strategy will bring the network cost down for some competitive providers, but the competitive regime productivity will only marginally improve.

Backhaul Infrastructure Networks

In the World Broadband Conference in February 2009 held in Sydney (where Senator Nick Minchin gave an opening address), at the end of the second day discussion forum of the there was talk between several major players in the telecomms industry about the failings of the competitive regime in long haul fibre networks.

The very strong general consensus was that if one long haul provider has a seemingly 'commercial' link (say for example between Brisbane and Rockhampton), then that provider, being the only competitive provider will charge as much as possible for the use of that link.

Another competitive long-haul provider will 'see' that this is a commercially viable place to put in a competitive long-haul link, but their customer user price will be very close to the same ball park price as the first provider (and they intend to amortise rather quickly). The problem is that the expected customers are not in numbers or use as their business case made out so they amortise over a much longer period in a Second Best scenario.

Now the problems begin! A third long-haul provider sees the commercial opportunity and establishes a third competitive long-haul link between these two locations and then finds out their are virtually no customers at the high price, so this third long-haul operator drops its customer rates to say 35% of the other two competitive providers, and gets some customers – but not really enough ROI to make this a financially successful venture, so now this is clearly a poor Second Best scenario.

The other two now drop their customer prices to keep their customers (and this is where the ACCC would become satisfied that they had done their job in that 'robust competition' had brought the end user prices down). Now, the first long-haul system was operating at say 70% usage, the second at say 30% usage and the third at say 20% usage, their respective managements are getting about 35 to 50% of the income they expected before the competitive regime have made all these three long-haul links very low ROIs.

So instead of having three long-haul links in robust competition with each other, we have three long-haul links with too little traffic to make sufficient ROIs for the three infrastructure providers, and this is now a very poor Second Best scenario, and legal issues arise.

Conclusion

This short addendum paper relates to the "Theory of the Second Best" which has a direct application in the efficient and productive economic strategic structuring of the NBN, and the whole telecommunications infrastructure in Australia (and elsewhere).

In the Select Senate Committee Hearing on the 20th July 2009, it was apparent that although Senators asked questions asking me to explain how the Theory of the Second Best worked, it was extremely difficult to explain without concrete financial examples to show how the infrastructure regime works and directly compare that to how the competitive regime works with respects to providing infrastructure.

The concrete financial examples that I have presented here clearly show that when the competitive regime is used to install and/or operate infrastructure, the economic productivity is very low in comparison with business practices that are common with the infrastructure regime.

When Pay TV was introduced into Australian metro areas, this was done in a competitive regime environment costing then about $4.7 Bn when if this had been rolled out under the infrastructure regime this equivalent infrastructure would have costed Australia about $1.67 Bn, so about $3.3 Bn was wasted. In productivity terms 137% of the infrastructure outlay was wasted through working in the competitive regime.

With mobile phone networks, these productivity figures are much worse than for the Pay TV infrastructure because the mobile phone networks have several infrastructure competitors.

The prime symptoms that show the productivity failings of the competitive regime approach of installing and operating telecomms infrastructures in Australia is that:

- Only the higher density populated areas (ie metro and regional) have adequate telecomms infrastructures,
- The lower density areas have a ($150 M/pa) USO subsidy to make them look commercially attractive,
- The HFC infrastructure and its associated backhaul are at least 85% geographically duplicated, and neither is near full network capacity,
- The HFC competitive infrastructure costs were far more than double (2.76 times) one well installed and operated network under the infrastructure regime,
- Competitive mobile networks have symptomatic black holes that continue for several years,
- Competitive long-haul networks very quickly become non-commercial when competition is introduced,
- Broadband Internet is installed and cannot provide Broadband standards – hence an ongoing black hole list in Broadband too,
- ADSL has being installed where Cable Internet already can provide better Broadband speeds, where FTTP should have been installed years ago
- The NBN will construct its network on a commercial basis as it is deemed to be sold to private equity by about 2014, and this self-defeats the purpose of the NBN.

It therefore follows that utilising the competitive regime frame of reference to provide infrastructure is a folly that will very quickly end up with large amounts of scarce revenue being unwisely invested into duplicated high ROI network infrastructures. Network infrastructures that commercially have a high ROI will be installed in high preference to infrastructures that have low ROIs – meaning that non-metro areas will again be deserted by commercial / competitive infrastructure businesses, and the NBN initiative will be lost again.