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Anatomy of a public-private partnership: Hold-up and regulatory commitment in Ultrafast Broadband

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ABSTRACT

In recent years, the preference for purely private funding and ownership of telecommunications networks has given way to a ‘new wisdom’ that some form of public funding is now likely necessary if faster and more capacious next generation access (NGA) networks are to be constructed in a timely fashion for the majority of the population. Policy-makers are charged with deciding how that public investment will take place. One approach is via Public-Private Partnerships (PPPs), where public and private actors collaborate in UFB (Ultrafast Fibre Broadband) investment, construction and operation. However, the body of analysis of PPPs in NGA networks to guide policy-makers is scant.

By using the concept of regulatory commitment, the paper compares the experiences gained in a hold-up situation in PPPs in other infrastructures (e.g. roading) with the UFB context. A case study of New Zealand’s Ultrafast Fibre Broadband Initiative is used to draw new insights for government purchasers and regulatory agencies. In comparing the different forms of PPPs, the paper shows that UFB PPPs reverse the typical direction of financing and ownership observed in roading PPPs. Financing and asset ownership are separated in UFB PPPs, increasing the potential for misalignment of incentives and the likelihood that the public party can use its legislative powers to alter regulatory settings after the PPP contract is signed, and thereby hold up the private party once existing network assets are sunk. Whilst the government instigating the PPP may not be inclined to act opportunistically, a successive government facing different political priorities does not face the same incentives. To the extent that the private party can anticipate this risk, it should structure the initial agreement to ensure that the public party is penalised if such an event occurs (i.e. an automatic right to favourable renegotiation or payment of compensation). Such terms will discourage opportunism, so that the project benefits from time-consistent alignment of incentives and objectives.

1. Introduction and motivation

From the early 1980s to around 2010, the prevailing wisdom in telecommunications policy was that the private sector was best-placed to own and fund investment in enhanced and new networks (OECD, 2007). However, growing realisation that substantial sums would be required to build very high capacity NGA networks, uncertainties about how demand for NGA connections would

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materialise, and concerns that existing regulatory arrangements were failing to provide appropriate investment incentives have led to a renewed interest in the role of governments (national, state and municipal) as part- or full-funders¹ of new telecommunications infrastructure (Cave & Hatta, 2009; Gómez-Barroso & Feijóo, 2010; Cave & Martin, 2010; Ragoobar, Whalley & Halle, 2011; Beltrán & Van der Wee, 2014; Rendon Schneir & Xiong, 2016). Cave and Martin (2010, p505) observe: “under pressure from the credit crunch, the earlier view has virtually reversed itself. Some form of public funding is now seen as necessary and appropriate almost everywhere, not simply as an aberrant feature of Asian economies”.

If governments will inevitably become investors in NGA networks, determining how that investment will take place becomes a relevant policy issue. A fundamental choice exists between returning to the pre-1980s arrangements where a government entity designs, owns, builds and operates the network (albeit procuring some elements from the private sector during construction), and adopting a more nuanced approach where public and private actors collaborate in network investment, construction and operation (Shleifer, 1998; Hodge & Greve, 2007; Gómez-Barroso & Feijóo, 2010, Nucciarelli et al., 2013).

The former approach is characterised by Australia's fully government-funded and owned NBN project² to deploy a fibre-to-the-home (FTTH) network to 93% of residences, supplemented by satellite and wireless connections to the remainder (Beltrán, 2013; Given, 2010; Howell, 2012). Whilst the ambitious project has been downscaled to a more modest ‘Mixed Technology Model’ (MTM), the government still controls project design and owns and operates the fibre network commissioned by it. By international standards this extent of government control and ownership is exceptional. For a variety of reasons, including budgetary limitations and avoiding public crowding-out of private sector investment and competition, public-private partnerships (PPPs, often referred to as public-private initiatives - PPIs) are the preferred approach in the vast majority of cases (Falch & Henten, 2008; Nucciarelli, Sadowski, & Achard, 2010; Ragoobar, Whalley & Halle, 2011; Sadowski, Nucciarelli, & de Rooij, 2009). This approach is exemplified by New Zealand's Ultra-Fast Broadband Initiative (UFBI), where the government has partnered with four firms using two distinct arrangements to fund around one third to one quarter of the cost of building an FTTH network to around 75% of the population by 2018 (Sadowski, Howell, & Nucciarelli, 2013) (subsequently extended to 85% of the population by 2024).

Despite an expressed policy preference for PPPs, so far there has been little formal analysis to guide policy-makers seeking to use the instrument to fund NGA networks. In part, this is because most projects are only in their early stages, so it is possibly too soon to identify patterns peculiar to investments in NGA networks. Furthermore, comparison is complicated by each project being characterised by the specific objectives of its government sponsors,³ their different scopes (national, regional and local) and the wide range of institutional arrangements under which they have been undertaken. Nonetheless, the body of analysis of PPPs applied in the development of other infrastructures can be used to provide insights to guide the design, implementation and analysis of investments in NGA networks. Although “the economics of PPPs is still imperfectly understood, (as) practice has run ahead of theory” (Engel, Fischer, & Galetovic, 2013, p. 84), it provides a logical foundation for thinking about the use of the instrument for investments in NGA networks – where it is also noted that “the stampede towards public funding ... has outstripped much analysis (Cave & Martin, 2010, p. 506).

Roading PPPs in particular may be instructive for policy-makers considering investments in NGA networks, for at least five reasons. First, roading projects were amongst the first PPPs to be undertaken and analysed, so consequently the body of economic analysis available to be drawn upon is both larger and more advanced than that of other infrastructures. Second, both are considered important facilitators of economic growth, but realising it is complicated by cost structures exhibiting very high levels of fixed and sunk costs.⁴ Third, both form part of transport networks where third parties have considerable autonomy over how and when they manage the movement of their cargoes over them. Fourth, future demand for their capacity and other qualities is notoriously difficult to predict in advance, given their long life and the potential for technological advances in the vehicles used to transport cargoes using them during both the PPP project and infrastructure life-spans. And fifth, their use is often influenced by government regulations and distributional objectives (e.g. safety, universal service). Previous research on public investment in very high capacity NGA networks has mostly focused on different types of PPP investment models (CEU, 2014; NTIA, 2015), to lesser extent on changes in the mechanisms of control and ownership of very high capacity NGA networks during their implementation. In comparing roading PPPs with public investment driven PPPs in NGA networks, the focus of this paper is on the shift of ownership and control due to hold up problems during the development of NGA networks.

This paper addresses the comparative lack of analysis of PPPs in NGA networks by applying the learnings from classic (notably roading) PPPs to the circumstances of a particular group of UFB PPPs – the New Zealand UFBI agreements – from their instigation in 2008 through to the current point in time, by way of a case study. Particular emphasis is given to the approaches taken initially to address matters of ownership and risk allocation during contract negotiation (addressed in Sadowski et al., 2013), as these have been demonstrated to be particular issues in roading PPPs. The analysis suggests some major differences arise from a different locus of ownership of the PPP infrastructure and the effects of competition and regulation that pose very different challenges for the design of

¹ Whilst government engagement can span all or any of the roles of developer, user, rule-maker and financier (Gillett, Lehr, & Osorio, 2004), the focus of this paper is on its role as financier.

² Whilst initially proposed as a PPP with mixed public and private shareholding (Falch & Henten, 2010), NBN Co will be fully government-owned at least for the duration of its construction, as the Implementation Study prepared after the initial proposal was released indicated that the likely rate of return was insufficient to support private investment (Given, 2010).

³ Cave and Martin (2010) suggest interventions occur to promote equity amongst citizens, as a matter of industrial policy to address market and regulatory failures and as an economic stimulus given global and national macroeconomic circumstances.

⁴ This contrasts to, for example hospitals, where the proportion of sunk costs is lower, due to secondary markets existing for specialised equipment and the ability to repurpose buildings and other facilities (e.g. carparking) should the project face financial difficulties.

UFB PPPs than for roading projects. These warrant particular attention by both public and private sector entities contemplating the use of PPPs for NGA projects.

Specifically, UFB PPPs such as the UFBI reverse the typical direction of financing and ownership observed in roading PPPs. Generally, for UFB PPPs, the public party designs and finances an asset built, operated and ultimately owned by the private party. This arrangement ‘unbundles’ the elements deemed to be more efficiently managed together in a classic PPP. The potential for misalignment of incentives increases the risks for both parties. Notably, it reverses the traditional direction of the ‘hold-up risk’ compared to roading PPPs. The private party bids for the right to build and operate the infrastructure, but the public party controls the funding and the regulatory environment in which this will occur. The public party can act opportunistically by changing the regulatory rules once the PPP agreement has been struck, so that the returns available to the private party are reduced, and the success of the project is jeopardised. It is unlikely (though not impossible) that the government in place at the time the PPP deal is struck would be motivated to change the settings in this manner. However, as no government can bind its successors to commit to maintaining its policies, a successive government may use a change in regulatory settings to achieve a different political objective. The private party is exposed to this risk as it threatens service revenues and asset values if it crystallises after transfer of the asset to the private party has commenced, or after other physical assets owned by the partner are committed to the project. To the extent that the private party can anticipate this risk, it should endeavour to take it into account when agreeing the terms at the outset of the project (i.e. an automatic right to renegotiation or payment of compensation if the event occurs).

The paper proceeds as follows. Section Two summarises the current literature on PPPs and applies it to investments in NGA networks. Section Three then describes the salient features of the New Zealand UFBI PPPs. Section Four traces the evolution of the UFBI PPPs between instigation in 2010 and the present, highlighting the consequences of a significant change in regulatory settings in 2012. Section Five concludes the paper by summarizing the argument and drawing conclusions.

2. PPP theory in the context of NGA networks

Although many different definitions of PPPs exist, it is generally agreed that they are characterised by long-term relationships between the public and private partners sharing project funding and financial risk in a manner that aligns the achievement of government objectives with the profit objectives of the private partner(s) (EC, 2004; Falch & Henten, 2010; Fausch, 2008). In a narrow definition favoured by the IMF, PPPs apply to arrangements for procuring infrastructure traditionally funded by governments, such as the construction of roads and hospitals, where they typically take the form of the private party designing, building, owning and operating the infrastructure for an extended period of time before ultimately transferring it to government ownership (so called BOOT – Build, Own, Operate and Transfer – PPPs) (Cheung, Chan, & Kajewski, 2012; Engel et al., 2013). Arguably, many PPPs meeting this definition have been undertaken to enable governments to attract private investment whilst claiming they are not privatising, or for the strategic purpose of moving high-cost and risky assets off government balance sheets (Engel, Fischer, & Galetovic, 2009). However, a more encompassing definition favoured by the European Commission uses the PPP term to describe any co-operative institutional arrangements between public and private sector actors that facilitate risk-sharing, realise long-term returns on investment for both public and private sector actors, encourage greater innovation efforts and earn better value-for-money from infrastructure (Hodge & Greve, 2007; EC, 2009, p. 615; Ragoobar, Whalley, & Harle, 2011).

The common characteristic of both forms of PPP are the bundling of facility design, building, finance and operation over an extended period of time. In a BOOT (Building, Operating, Owning and Transfer) arrangement, it is the private party that undertakes the bundled activities. Alternatively, the bundled activities may be undertaken by a joint-venture entity established for the purposes of the project. The bundling arrangement tends to be more cost-efficient than traditional government procurement (Nucciarelli et al., 2010) as it enables trading off the various costs and benefits of design, construction, maintenance and service provision by a single party (Hart, 2003). The government party can structure the contract with the bundling entity to finance and build the infrastructure and supply services of a given quality, so it is in the bundling entity's interest to achieve the most efficient long-run outcomes (Bentz, Grout, & Halonen, 2005; Iossa & Martimort, 2008; Martimort & Pouyet, 2008). In a classic BOOT PPP, the bundling entity is the private party. To the extent that the project is exposed to risks that are foreseeable, contract terms can be devised to ensure that these risks are allocated to the partner (public, private or joint) best able to manage them (Williamson, 1976; 1985). For example, if the private party's future income is influenced by future changes in government policy (e.g. road traffic volumes on a toll road influenced by fuel taxes) then the government should bear the costs if such an action is taken.

However, the questions of ownership and the allocation of the risks associated with PPPs are important because inevitably the contract(s) are incomplete (Hart, 2003). Specifically, the longer is the term of the contract, the harder it is to foresee future events and the contingencies to address them, the less likely it is that the contract(s) will be able to specify terms that will be satisfactory to the parties to it, and the more likely it is that the agreement must be renegotiated (Guasch, 2004). Likewise, having entered into an agreement, each party becomes exposed to the opportunistic actions of the other. For example, the private party may bid a low price to get the contract (or more favourable terms in the joint venture arrangement), then ‘hold up’ the public party by subsequently demanding renegotiation to raise the fee (Williamson, 1989). However, the public party may deliberately induce renegotiation by under-paying initially so that it can elude stringent spending limits in the present, knowing that the ‘soft budget constraint’ of government funding means that it cannot easily commit not to bail out the private firm in the future when the under-funding becomes apparent (Engel et al., 2009). Such a strategy may be even more attractive politically if it is the contracting government's successor (likely a political rival) that must approve the additional funding.

For PPPs in NGA networks,⁵ the question of initial and ultimate ownership of the network assets is a critical consideration. Due to high sunk and fixed costs of optical fibre elements in conjunction with demand uncertainty, the risks of developing NGA networks can lead to a situation in which private parties are unable or unwilling to invest. In order to account for these characteristics, investment models using public funding have been used to build NGA networks in a number of countries. The private party is best placed, via a combination of information, experience and existing infrastructure ownership to design, build and operate the NGA network. However, network ownership and the methods of financing the project differ substantially from classical BOOT PPPs. These differences are material to the achievement of bundling efficiencies from using a PPP, as opposed to alternative procurement and/or subsidy arrangements.

In a classic BOOT, the private party provides the majority of the finance for the project, and whilst initially owning the infrastructure and the risks associated with it, ownership is ultimately transferred to the public party. This arrangement is diametrically opposite to the financial arrangements of PPPs in NGA networks, where the public party part- or fully-finances the construction of a new network. Public finance is necessary because the government wishes NGA networks to be constructed earlier than private financiers, who will delay investing until satisfied that the project will make a reasonable economic return. Alternatively, the government may wish to invest in a network where private investment will never be forthcoming as the project will never generate a satisfactory return.

In most cases the public party invests liquid financial capital in a venture where the private party's contribution (aside from its human capital) takes the form of existing physical capital (existing network elements, rights of way, etc), typically comprised of sunk investments. These assets are likely used already in the production of products and services in addition to the NGA network (e.g. electricity distribution, provision of standard telecommunications and broadband services), so lack the fungibility that is characteristic of the financial contributions of private parties in traditional (e.g. roading) PPPs.⁶ This has two major consequences. First, as the physical assets of the PPP for NGA networks become closely intertwined with those of the private party's other activities, the private party and not the public one is the obvious ultimate owner of the PPP infrastructure if the synergies from bundling design construction and operation of the infrastructure are to be achieved. Second, as the owner (or part-owner of sunk investments), the private party becomes exposed to the public party acting opportunistically to 'hold up' not just the returns from the NGA network project but also those pertaining to the other activities in which the original assets brought to the partnership are applied. That is, a PPP in the NGA network area appears to reverse both the direction of ownership and the locus of hold-up risk observed in classic (roading) BOOT PPPs.

The 'reversal' of ownership direction and hold-up risk for PPPs in NGA networks changes the incentives associated with the project because project financing has become 'unbundled' from the other project elements. It is therefore not clear that the ensuing arrangements will achieve the economic synergies of a classic PPP. In a classic PPP, the price the government ultimately pays the private party is disciplined by prices in finance markets. The obligation to meet externally-imposed financial milestones incentivises the private party to employ the most efficient long-term design and operational practices, thereby reducing the price paid by the public party. However, PPPs in NGA networks financed by the public party lack the disciplines of external financial markets – indeed, the very reason why the public party is the funder is because the discipline of external financial markets is too stringent to enable the network to be built when the government prefers. Consequently, the price that the private party bids in order to participate in the project will be contingent upon the income it expects to earn from the assets it brings to the partnership, and the additional costs it faces to build and operate the network desired by the public party. It is also quite likely that the public party will also specify the design of the physical network and the institutional arrangements that must be met as a condition of participation (for example, open access and/or structural separation of network and retail activities). This further 'unbundles' the elements leading to the efficiency advantages of classic PPPs over standard procurement.

Unlike classic PPPs, the return the private party expects to receive for its existing assets is unlikely to be governed by activities in competitive markets. In most cases they are governed by regulations – often administered by the very same public party with whom the PPP is undertaken. Unless the public party can credibly commit to forbearing from changes to the regulatory environment under which the private party prices its engagement in the PPP, then the private party faces the risk that future regulatory changes will jeopardise the financial returns from both the PPP and other activities. Whilst the public party entering the PPP is unlikely to change the regulatory arrangements to jeopardise the project (and indeed, the public party may take advantage of the 'soft budget constraint' to ensure that the project proceeds, the ability to do so enhances the value of the project for the private partner – Cambini & Rondi, 2017, 2012; Bortolotti, Cambini, Rondi, & Spiegel, 2011), as one government cannot bind its successor to abide by its policies, it cannot credibly commit that a future government will not change them.

A private party anticipating that a regulatory change will jeopardise its future revenues will either price its entry into the partnership to take account of this risk (thereby ensuring that the public party – i.e. taxpayers – bears the costs of the risk, regardless of whether or not it eventuates) or will require terms in the agreement that protect it from the consequences (for example, payment of a penalty or mandatory renegotiation in the event that the regulatory settings change). These arrangements parallel the provisions

⁵ According to the OECD definition (2011), the term "NGA networks" is used to "describe the requirement of fibre coming closer to the end-user, or providing the direct connection". Furthermore, "the copper or cable wire is to a larger extent or fully replaced with fibre-optic technology" (OECD, 2011). Recently, NGA networks providing an access speed higher than 100 Mbit/s have been characterised as very high-capacity (VHC) networks by referring to "wholly of optical fibre elements at least up to the distribution point at the serving location or which is capable of delivering under usual peak-time conditions similar network performance in terms of available down- and uplink bandwidth, resilience, error-related parameters, and latency and its variation." (EC, 2017).

⁶ A comparison would be where the private party to a roading PPP contributed the land on which the road was to be built, and the public party the funding to build the road.

observed in BOOT PPPs, where the public party requires the private party to bear the costs of strategic price inflation leading to the public party being held up. However, in the case of NGA networks, the provisions must protect the private party from being held up by the public one. And whilst in the classic case, the terms help to ensure that incentives are aligned to deliver the most efficient arrangements, in the case of NGA networks, the incentives associated with the ‘soft budget constraint’ would appear to reward the political interests acting opportunistically, at the taxpayers' expense, especially if there is political advantage from doing so.

As has been demonstrated for utility sectors ranging from transportation, telecommunications to electricity (Henisz, Zelner, & Guillén, 2005; Henisz & Zelner, 2001; Levy & Spiller, 1994; Sadowski, 1997; Spiller & Vogelsang, 1997), regulatory commitment has been vital for long-term private investment in what can be described as problematic environments (i.e. industries characterised by rapid changing technological and market environments) (Levy & Spiller, 1994). In this tradition, it has been argued that private investment and performance in the sector will be satisfactory as long as there are (a) substantive restraints on the discretion of the regulatory agency (e.g. based on explicit and transparent price regulation) (b) restraints on changing the regulatory system (e.g. licences issued cannot be altered without consent of all parties involved); as well as (c) institutions which are aimed at enforcing substantive restraints and restraints on the changes in the regulatory system (e.g. imposed by the judiciary system) (Levy & Spiller, 1994). Regulatory commitment can facilitate investment in upholding existing contracts between different parties leading to well-defined property rights and higher certainty for private investment.

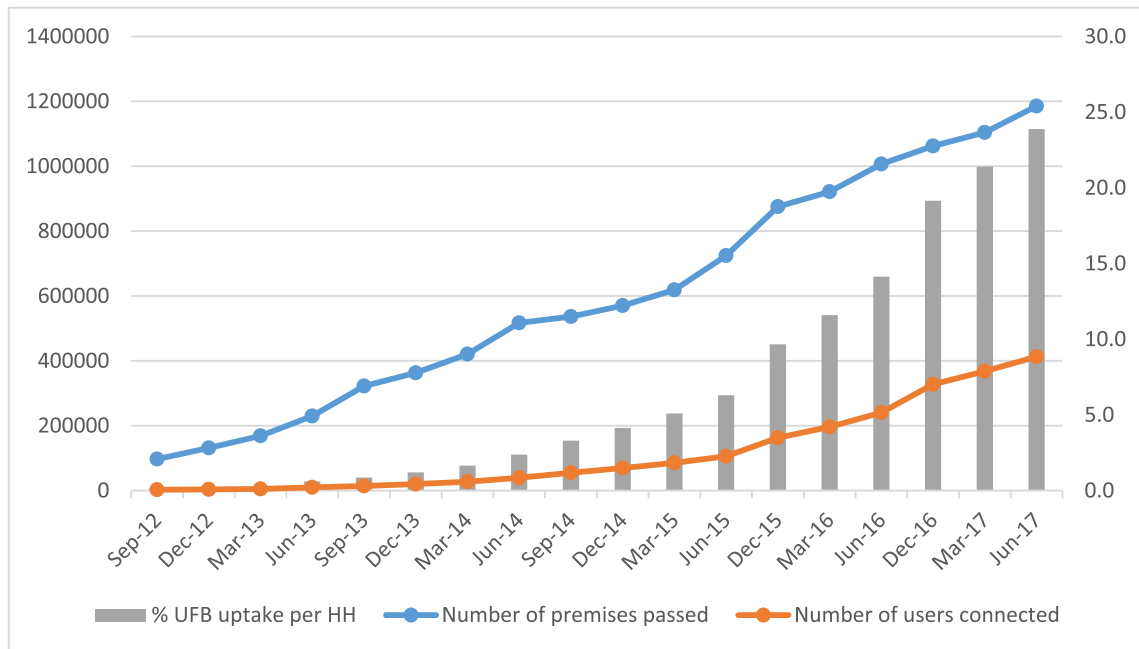
However, the credibility of the regulator's commitment may be undermined. In principle, the design and operation of the PPP should be undertaken at arms-length from the operation and enforcement of sector regulation if the perception of neutrality of government as investor and government as regulator is to be maintained. However, the government entity negotiating the PPP may (and indeed is quite likely to) use contractual undertakings by the PPP partner to regulate activities on the PPP network. These will stand in addition to, and perhaps in conflict with, regulatory obligations overseen by a separate regulatory agency. If the regulator is not a party to the PPP negotiations, then it is unable to offer credible commitment that future regulatory decisions made in relation to the legacy network will not affect the viability of the PPP investment. Indeed, an independent regulator creates risks for the private party that must be taken into account in negotiating the PPP contracts, unless an assurance is obtained ex ante that the regulatory settings will not change materially during the life of the PPP. Arguably, this may create a case for the regulator not being independent where PPPs are concerned – that is, the regulator could be a party to the PPP negotiations to be involved in the PPP negotiations, to identify and/or ameliorate potential conflicts.

For a summary of the different elements of PPPs in roading and NGA networks see [Table 1](#).

The case study of the New Zealand UFB PPPs, which we will now explore in detail, illustrates the consequences of public party opportunism in an actual UFB PPP. The case is instructive, as it does not appear that any of the private parties anticipated the changes that occurred in the regulatory arrangements. The arrangements governing the UFB PPPs have resulted in the private party being disadvantaged by the changes to the regulatory environment made after the PP terms were agreed. The analysis indicates that additional caution is required in the negotiation of all PPPs involving infrastructure on which the supply of regulated services is undertaken – particularly UFBs.

Table 1
Differences between PPPs in public roading and public NGA broadband networks.

	Public-Private Partnerships	
	Roading	NGA networks
Objectives		
Time horizon	Long term	Long term
Distributional	Road safety and geographical access Earlier build than with public finance alone	High coverage and access Earlier build than with private finance alone
Ownership		
Initial ownership	Private party	Shared between public and private party
Cost characteristics		
Cost structure & efficiencies	High levels of fixed and sunk costs	High levels of fixed and sunk costs
Bundling		
Responsibility	Design, build operate and finance (private party)	Design and finance (public party) Build and operate (private party)
Bundling entity	Private Party	Unbundled
Financing		
Initial investment	Private party	Public party (or shared when private party brings existing network investments)
Capital repayment	Public party pays private party over time (toll revenues plus agreed repayments)	Private party pays public party (loan repayment or share purchase)
Demand structure		
Demand risks	High uncertainty	High uncertainty
Hold-up risks		
Renegotiation of contracts	Private party can hold up public party	Public party can hold up private party
Ultimate ownership		
Transfer of assets	Public party	Private party
Regulatory commitment		
Pricing of services	Influence on viability of business case (tolls)	Influence on viability of business case (access rates)



(Data: Ministry of Business, Innovation & Employment, 2017)

Fig. 1. UFB implementation between 2012 and 2017.

(Data: Ministry of Business, Innovation & Employment, 2017)

3. The New Zealand UFB PPP terms

The New Zealand UFB PPPs have attracted much interest as they represent one of the earliest examples of shared government and private sector financing of NGA networks covering a very large proportion of the population. They are interesting from both a political perspective, as the arrangements were a flagship policy of the political party ultimately victorious in the 2008 general election, and from an economic perspective for their use of the PPP instrument (Hooper, 2013).

The partnerships see the government contributing between one third and one quarter of the cost of building a FTTH network passing 75% of New Zealand residences by 2018. An initial investment of NZ\$1.8 billion was extended by a further NZ\$270 million in August 2017 to extend fibre-to-the-premises access to 87 percent of the population by the end of 2022 (Ministry of Business, Innovation & Employment, 2017). UFB rollout and uptake data between 2012 and 2017 are given in Fig. 1. Both build and uptake rates have regularly exceeded government-set targets since mid-2014. However, it is notable that it took three years to reach the point where five percent of households passed were purchasing a fibre connection. Uptake rates increased rapidly from the end of 2015; by June 2017 25 percent of households capable of connecting had done so.

In order to facilitate the rollout of UFB, a number of PPP arrangements between the public partner (Crown Infrastructure) and four regional partners have been initiated since 2008 Northpower Limited (1.6% of UFB total coverage) (mainly in the North of New Zealand: Whangarei), Waikato Networks Limited (WNL) (mainly areas Hamilton and Cambridge) (13.7%), Christchurch City Holdings Limited (Christchurch and Rangiora) (15.3%) and Chorus Limited (all areas except those covered by other three companies) (69.4%). These PPPs are interesting from both a political perspective, as these arrangements were a flagship policy of the political party ultimately victorious in the 2008 general election, and from an economic perspective for their use of the PPP instrument (Hooper, 2013; Sadowski et al., 2013). The UFB map of New Zealand (Fig. 2) indicates the different (mainly urban) areas in which NGA networks were located in 2017.

An important characteristic of the UFB PPPs is that the public party has entered into two different arrangements with two different types of partners bringing different assets, skills and experience to the partnerships. This enables comparison of the effects of regulatory changes on two different sets of agreements. In one arrangement, the private partner is the structurally separate owner of country's legacy copper telecommunications network infrastructure, Chorus, which brought a significant amount of co-invested copper broadband infrastructure (Fibre-to-the-Cabinet and backhaul) to the partnership. The other arrangement covers three distinct partnerships with entities having no existing telecommunications infrastructure, but bringing other assets into the venture relating to rights of way and experience in constructing fixed line networks (two electricity lines companies and a municipal entity). The history of the project and the details of the agreements are fully explored in Sadowski et al. (2013). We summarise here only those elements salient to the discussion of ownership and hold-up risk.

The two different sets of PPP arrangements ultimately negotiated reflect the different assets brought to the partnerships. The initial model proposed for the PPP (subsequently applied to the lines companies and the municipality) was for a new, Crown-owned



(Data: Ministry of Business, Innovation & Employment, 2017)

Fig. 2. UFB map of New Zealand 2017

(Data: Ministry of Business, Innovation & Employment, 2017)

company (UFB Co) overseen by a new government entity Crown Fibre Holdings to be established and funded by the government to construct fibre loops sufficient to support a GPON FTTH network delivering services at defined (regulated) speeds (upstream and downstream) in a defined locality. The private partner funds the ‘drop’ from the kerb to those premises where end consumers wish to connect to the new network, and purchases a share in the UFB Co. Connections (within a predetermined specification regarding length, accessibility etc.) are provided at no cost to the end consumer. The partner thus gradually assumes ownership of the UFB Co. The returns on the partner’s new UFB investments are generated by charging retailers a contractually-specified monthly fee for the right to sell UFB Co network capacity with bundled ‘over the top’ services to the end consumers (partner firms are not able to be retailers themselves under New Zealand’s ‘structural separation’ arrangements). The capital paid by the partner for shares in the UFB Co is then applied to extend the footprint of the UFB into adjacent areas. Ultimately, when the entire targeted population in a defined area has purchased fibre connections, Crown Fibre Holdings will have recovered the initial government investment and the UFB Co will be fully owned by the partner.

The originally-proposed arrangement, known as the ‘capital recycling model’, insulates partners from the financial risks of demand uncertainty associated with the FTTH network, as they were not required to sink capital until revenue streams from selling services were available. The Crown (i.e. taxpayers) initially bears this risk. However, once a fibre connection has been laid to the premises, the partner has outlaid capital, and bears the financial risk of the end consumer ceasing to purchase a fibre connection and reverting to copper. This outcome, although considered unlikely (fibre being assumed unconditionally dominant over copper), is not

infeasible, as the copper connection supplying fixed broadband to the premises previously must remain in place to maintain consumer choice of fixed line infrastructures (Heatley & Howell, 2010a, 2010b, 2010c). Prospective partners in the tendering process ‘bid’ for the amount of government funding required for them to participate in the project for a defined area given the contractually-specified wholesale price caps set by Crown Fibre governing the sale of services to retailers servicing the end consumers. Ultimately, Crown Fibre Holdings let tenders for three capital recycling UFB Co partnerships, covering around 30% of the targeted population.

The capital recycling model, however, proved politically and financially unsuitable for the incumbent copper network operator Chorus. Chorus already owned a fibre-to-the-node (FTTN) network in all of the proposed UFB Co areas, so had already invested in a substantial amount of the network infrastructure required for the UFB Co. If Chorus was not selected as a partner, it risked the stranding of much of this investment. However, its lower real costs of participation meant that it could bid a lower price than its competitors, but one still above the cost of providing the services specified by Crown Fibre Holdings. Paying a ‘competitive’ price to Chorus based upon the bid of the second-lowest cost tenderer was neither politically acceptable nor in the interests of taxpayers. Consequently, at the same time as negotiating with other parties on the basis of tenders compliant with the capital recycling model, Crown Fibre Holdings actively negotiated a separate agreement with Chorus that endeavoured to procure its participation in the project at a price much closer to its actual costs than competitive tendering would realise.⁷

The agreement finally reached saw the government granting Chorus interest-free loans to build its share of the FTTH network (to which Chorus had full property rights immediately upon deployment) and taking a non-voting equity share in the firm. Chorus was required fund the drops from the kerb to premises and sell services to the same contractually-specified price schedule as the UFB Cos, at the same time as it continued to supply regulated services on its copper network. The firm was required to structurally separate from its parent Telecom New Zealand, which would continue to participate as a retailer only in the fixed line market. Chorus would be required to continue maintaining its copper network nationwide, so long as separated retailers still wished to sell services over it. Providing a range of mutually agreed FTTH roll-out and uptake targets were met and the loans were repaid as agreed, the Crown's share would revert to Chorus at the end of the partnership. However, if the terms were not met, then a number of penalties (both financial and nonfinancial) would be imposed. The most onerous of these was the ceding of control of the firm (covering both its copper and fibre businesses) to Crown Fibre Holdings.

The notable difference between the UFB Co and Chorus agreements is that Chorus is directly exposed to FTTH demand uncertainty. If demand does not materialise for the connections built to the PPP specifications, the cost is borne by Chorus, as it must still meet rollout and uptake schedules and repay the loans by the agreed dates even though its revenues will be lower than expected.

On the one hand, as Chorus owns the copper network, in principle it can influence the fibre uptake rate by making its copper connections less desirable (e.g. increasing prices or degrading service). If it does not sell fibre connections, then for the most part it will continue to derive revenues from selling copper connections to the end users who would otherwise have substituted to fibre. On the other hand, Chorus does not have complete control over how it prices copper connections, or the quality at which they are supplied, as these elements are subject to regulation under the Telecommunications Act 2001. Its ability to manage the substitution rate, and hence to determine the prices and terms of its participation in the PPP are critically dependent upon regulated revenues from selling both fibre and copper connections.

The anticipated future revenues from copper connections would have been a crucial component in determining the conditions under which Chorus was willing to participate in the PPP. To ensure that it was in fact getting value-for-money for the taxpayer, Crown Fibre Holdings would also have had to make some assumptions about the future price of copper connections, for both the Chorus and UFB Co partnerships. Crown Fibre Holdings set the initial regulated fibre price so that it was equivalent to the prevailing regulated copper access price, adjusted for the additional speed available on the fibre connection, in order to facilitate the earlier uptake of fibre connections than would have occurred if it was priced at cost. Any change to the regulated copper price would therefore necessarily affect the rate of fibre uptake, and hence the ability for the government to achieve its policy objectives (Howell, 2013; 2012).

Somewhat surprisingly, none of the PPP agreements contain provisions penalising the Crown if subsequent changes to the copper regulatory environment left the partners financially disadvantaged. If the copper price fell significantly, the UFB Co partners would all face some risk that price-sensitive individuals might cancel their fibre subscriptions and return to copper, leaving the partners exposed to owning both a fibre drop and a share in the UFB Co earning no income. Most significantly, a decrease in the copper price would leave Chorus doubly disadvantaged – with reduced income from its legacy copper network reducing the ability to roll out new fibre in the first place and significantly delaying the uptake rate of fibre as copper became cheaper for existing users. One possible justification for the absence of such terms is that the private partners did not foresee the risk materialising, so did not request provisions to protect themselves from it. Alternatively, the risk of regulatory change may have been foreseen, but none of the parties believed that the government would allow any such change to occur as it would jeopardise achievement of the government's flagship political project. That is, the government as both project investor and sector regulator was considered to offer the equivalent of a regulatory commitment not to act subsequently in a manner deleterious to the partnership and specifically the private sector partners. Of the two explanations, the latter appears the more plausible, as evidence from European telecommunications markets suggest that investors do appear to rely upon governments exercising their legislative and regulatory powers to shore up the value of taxpayer investments in partly government-owned firms when unexpected events occur (Cambini & Rondi, 2017).

⁷ Howell (2012; 2013) outlines the strategic game whereby the government let one of the capital recycling tenders earlier than originally intended, to a competitor to Chorus. This signalled that the government was prepared to strand Chorus' FTTN assets if it did not bid a sufficiently low price for the right to supply the network in other areas.

Likewise, it appears that Crown Fibre Holdings was also either oblivious to the potential for regulated copper prices to fall, or was itself relying upon renegotiation and the soft budget constraint coming into play if it eventuated. If the regulated copper price fell, then delaying the rollout and uptake of UFB Co connections would be politically embarrassing, but potentially addressable by lowering the regulated fibre price in exchange for compensation paid to the partners to cover their losses (i.e. renegotiating). The alternative of not acting means that it will take longer for the government funds committed to the capital recycling plan to be recovered. In either case, the taxpayer faces higher out-of-pocket costs of renegotiating. These costs are in addition to delays in the acquisition of social benefits anticipated from using government funds to accelerate the fibre rollout in the first place.

However, the position is more complicated with regard to Chorus. Whilst lowering the fibre price and compensating Chorus is possible, it is unlikely to be politically acceptable, as Chorus is the subject of the copper regulation in the first place. Yet Chorus is so financially disadvantaged by a falling copper price that renegotiation of the PPP so as to make the financial terms of the loans and adherence to the uptake targets less rigorous is the only means of ensuring that the fibre build can be completed and salvaging the UFBI project politically. Once again, the taxpayer bears the financial and social costs of renegotiation, but the private owners bear any losses in capital value of their investments if renegotiation does not occur in a timely manner.

Whereas a private sector financier without the luxury of the soft budget constraint might have been motivated to safeguard the interests of investors by ring-fencing this liability in the PPP contract terms, the soft budget constraint blunts the incentives for a public sector entity to identify the risks and specify terms to address them in the first place. This may account for Crown Fibre not identifying the risk and accounting for it in the contracts. Alternatively, the risk may have been anticipated, but explicitly accounting for it in the contracts may have been politically unacceptable. In this case, all of the UFB partners would have had no choice but to rely solely upon the good faith of the Crown to protect them from the consequences of future Crown opportunism.

4. Regulatory change and the New Zealand UFBI PPPs

Subsequent activities show that it was unwise for the private partners to rely upon the Crown to act in good faith to manage the risks to which they were exposed.

The terms of the New Zealand UFBI PPPs were agreed between May 2010 and May 2011. The first successful tenderer for a UFB Co partnership was announced on September 9, 2010. Heads of agreement with Chorus were announced in January 2011, with the agreement being finalised on May 24, 2011. Meantime, in September 2010, the Ministry of Economic Development (MED, subsequently the Ministry for Employment, Innovation and Business – MBIE), responsible for the legislation governing telecommunications regulation, commenced consultation on the changes required to the New Zealand Telecommunications Act to take account of Chorus being a successful tenderer in the UFBI. The subsequent amendments received royal assent on June 30, 2011, one week after the last of the PPP agreements was signed (Howell, 2013).

The substantive issues addressed in the regulatory review pertained almost entirely to the structural separation of Chorus from its parent Telecom New Zealand Limited and regulatory provisions for the pricing of service on the copper network overseen by the Telecommunications Commissioner (industry-specific regulator). Regulation of the fibre network would continue by way of contracts between Crown Fibre Holdings and the PPP partners, albeit with adherence to agreed terms being monitored by the Commissioner (Heatley & Howell, 2010c). Principally, structural separation of Telecom's retail and network operations meant that it was no longer appropriate for wholesale elements to continue to be priced using a 'retail-minus' methodology (including the connections over which almost all of the country's broadband connections were sold). These would have to change to a cost-based pricing methodology. The Act instructed the Telecommunications Commissioner to use international benchmarking to determine draft prices for copper broadband connections by December 2012, to prevail from 1 December 2014. Chorus could request the prices be determined on basis of the TSLRIC methodology if the benchmarked prices were not acceptable. Prices for all other regulated products would continue to be determined using historic cost-based methodologies in place since 2006 or earlier.⁸

The salient point is that the legislation was consulted upon after at least one of the PPP contracts had been signed, so the partner concerned could not have been in a position to know for certain what regulatory risks it might have been exposed to. Yet the partner agreed to terms with no provisions concerning the effects of changes to copper regulation. Either the partner did not foresee a risk, did not consider it to be material, or was relying upon Crown goodwill not to materially alter the regulatory settings concerning the copper price. Furthermore, the changes were enacted after all of the contracts were signed. Whilst the later signatories might have been aware of the intentions of the legislation (if not its exact specifications) prior to agreeing the terms of their PPPs, they also do not appear to have anticipated it posing significant regulatory risk, as no additional terms shielding them from its effects were proposed. This suggests that they too had made the same assumptions as the first partner to sign. That is, government investment in the project could be interpreted as offering the same protections as a regulatory commitment not to substantially alter regulatory settings in a manner that could undermine the viability of the PPP investments.

With the apparent purpose of the legislative changes being to primarily to regularise the changes required in the copper market to address the structural separation of Telecom and Chorus, and to retain all other regulatory pricing mechanisms unchanged, it is plausible that the concerned parties – including the government members enacting the legislation – were lulled into believing that the pricing methodology change was simply a structural consideration, leaving regulated prices approximately similar to the currently-

⁸ It is noted that the New Zealand regulator has very little discretion in undertaking inquiries, setting prices or applying other remedies. These are all explicitly legislated in the Telecommunications Act. The effect is that although the regulator appears to be independent, there is negligible scope for independent action unless it is specifically allowed for in the legislation.

prevailing copper broadband access price. Certainly, the discussion documents associated with the changes make no mention of any substantive change in the copper price being expected as consequence of changing the copper broadband access price-setting methodology, or the effects that this might have upon fibre rollout and uptake rates. Indeed, structural separation of Telecom and Chorus was considered to be quite separate from the negotiation of the PPPs. The assumption of separate issues apparently justified deciding the copper regulatory settings before it had been determined if Chorus was a successful tenderer, and regardless of whether it could be competing with its copper network against another fibre partner, or whether it would be operating both networks in any given geographic location (Heatley & Howell, 2010c). This tends towards the conclusion that at the time the PPP agreements were signed, all parties (including government policy-makers and Crown Fibre negotiators) presumed that the copper broadband access prices in late 2010 could be relied upon as indicative of the regulated prices prevailing for the duration of the partnerships (i.e. until 2018).

Yet in December 2012, the Telecommunications Commissioner, adhering strictly to the methodologies prescribed in the 2011 amendments to the Act, announced draft copper broadband prices from December 1, 2014 some 23% lower than those at the time the PPP terms were agreed.⁹ Chorus's share price immediately collapsed amidst a significant flight of foreign capital from the firm. This suggested neither Chorus nor its shareholders had anticipated such a radical change in the copper price when negotiating the PPP terms in 2010. Had they done so, the effects would already have been factored into the share price, so it would have been unaffected by the regulatory announcement. The effect on the three UFB Co partners is unknown as they are not listed companies. However, it would likely have been less than that of Chorus, as they were much better insulated from the consequences (Howell, 2013), and combined accounted for only 30% of the project. Only 3800 fibre connections had been sold by December 2012 (by December 2014, when the new prices were intended to apply, only 69,000 connections had been sold, despite over 570,000 premises being capable of receiving a fibre service).

It also appears plausible that the government did not anticipate the sharp copper price fall. The Prime Minister¹⁰ immediately expressed concern that the decision "could prove problematic for the ultra-fast broadband network because consumers could be discouraged from switching from copper to fibre".¹¹ He would not rule out a "law change to cut across the final commission decision if it's seen as unfavourable", because under the New Zealand regulatory arrangements, the Commission could make recommendations, but ultimately it was up to the government whether to accept or reject those recommendations.¹²

Chorus also sought to take advantage of its ability to request a price review be undertaken using TSLRIC methodology, and it pursued judicial processes (ultimately unsuccessful) to get the Commissioner's original decision struck down.¹³ However, political opponents of the government, rivals to Chorus, and the former Telecommunications Commissioner came out strongly in favour of both the processes undertaken by the Commissioner and the proposed lower prices. They claimed that Chorus and its shareholders should have known that the price would fall, and that they alone should bear the costs arising. Any government action would constitute a serious transgression upon the Commissioner's position as an 'independent' regulator.¹⁴ A very successful public relations campaign¹⁵ was waged, based upon the opposition's claims that any move to overrule the Commissioner's prices amounted to the government wanting "most New Zealand households to pay around \$12 a month more for phone and internet services than they otherwise would".¹⁶ This made it politically very difficult for the government to overrule the Commissioner's prices determined using a process the Courts ruled to be perfectly lawful given the terms of the revised legislation.

The government's initial response was to bring forward a planned review of the regulatory environment.¹⁷ However, the review did not take place until August 20, 13¹⁸ (some eight months after the crisis emerged). Furthermore, its recommendations (including raising the proposed copper prices so that they were based upon the fibre prices)¹⁹ were ignored. Instead, in response to a political climate of growing hostility towards Chorus and the possibility that the government would provide it with more funding to build the fibre network, in November 2013 the Communications Minister ordered an independent inquiry into the state of Chorus's finances.²⁰ The report concluded that Chorus did indeed face a funding gap as a consequence of the regulatory change, but that much of the difference could be made up by restructuring its finances, including requiring shareholders to forgo dividends for the foreseeable future.²¹

Finally, in July 2014, some twenty months after the crisis erupted, the government and Chorus renegotiated aspects of the PPP. However, the terms appear to confirm that, in the light of the subsequent political activity, the government by then intended Chorus

⁹ <http://www.comcom.govt.nz/dmsdocument/9695>.

¹⁰ Reflecting the strategic threat to a flagship policy, the Prime Minister John Key rather than the Communications Minister Amy Adams, fronted the government response.

¹¹ <http://www.radionz.co.nz/news/political/122531/pm-not-ruling-out-legislation-over-broadband>.

¹² <http://www.nbr.co.nz/opinion/key-reaffirms-govt-willing-overrule-commerce-commission-chorus-pricing>.

¹³ <https://www.google.co.nz/webhp?sourceid=chrome-instant&ion=1&espv=2&ie=UTF-8#q=Chorus%20Court%20Commissioen%20broadband%20prices>.

¹⁴ <http://www.stuff.co.nz/business/opinion-analysis/8058701/Government-interference-doomed>.

¹⁵ <http://www.stuff.co.nz/business/industries/9155840/Chorus-big-winner-in-internet-reform-Coalition>.

¹⁶ <http://www.nbr.co.nz/opinion/key-reaffirms-govt-willing-overrule-commerce-commission-chorus-pricing>.

¹⁷ <http://www.beehive.govt.nz/release/review-provide-certainty-consumers-industry>.

¹⁸ <http://www.med.govt.nz/sectors-industries/technology-communication/pdf-docs-library/communications/review-of-the-telecommunications-act-2001/Review-Telco-Act-2001-discussion-document.pdf>.

¹⁹ <http://www.med.govt.nz/sectors-industries/technology-communication/pdf-docs-library/communications/review-of-the-telecommunications-act-2001/Review-Telco-Act-2001-discussion-document.pdf>.

²⁰ <http://www.beehive.govt.nz/release/ernst-amp-young-australia-undertake-chorus-assessment>.

²¹ http://www.beehive.govt.nz/sites/all/files/121213_EY%20Independent%20Assessment%20of%20Chorus_Report.pdf.

alone to bear the full costs of the regulatory change. Chorus could bring forward from 2019 to 2017 the drawing down of government loans in order to meet its projected cash flow shortfalls. However, if it took advantage of this facility, it would face an interest rate penalty.²²

The costs to Chorus were substantial. Its share price fell from a post-separation high of around \$3.70 to a low of \$1.30 in January 2014, following release of the financial review (the price did not return to the post-separation high until December 2015).²³ Its credit rating was downgraded by Moodys to Baa3 (its lowest investment-grade rating) and Standard and Poors to BBB (maintaining a negative outlook).²⁴ Dividend payments were suspended (they were not reinstated until 2016). A substantial proportion of its foreign investors quit, so that over 50% of its shares came to be owned by predominantly institutional New Zealand investors.²⁵ Ironically, given the extent to which New Zealand's welfare arrangements are dominated by state provision, many of these are government entities, such as the Accident Compensation Fund, the Government Employees Superannuation Fund and the 'Cullen Fund' established to begin the process of offsetting pay-as-you-go pension payments with partial pre-funding. They also include a number of private superannuation funds receiving government subsidies as part of the KiwiSaver personal retirement savings initiative. Taxpayers – as shareholders and beneficiaries – ended up indirectly bearing costs that they would otherwise have borne directly had the Chorus PPP included terms to compensate Chorus in the event of government opportunism.

However, the most significant consequence of two years of indecision was almost certainly a delay in the uptake of fibre connections, relative to what could have been expected had the copper price remained stable over the period concerned. With no certainty as to what the future copper access price would be, separate retailers faced few incentives to actively market fibre connections. This is illustrated in the negligible rate of fibre purchase between December 2012 and July 2014 (Fig. 1). Only 35,700 connections were sold over this period, despite 383,000 new premises becoming capable of being connected. Nearly 30,000 connections were sold in the last two quarters of 2014, following resolution of the dispute, when retailers finally had some certainty regarding the copper prices they would face in the future.

Fig. 3 also suggests that the rate of deployment may have been affected by the regulatory uncertainty as the actual rate of deployment of UFB connections does not begin to exceed the planned rate until after the matter of Chorus' refinancing was settled in July 2014. It is difficult to ascertain how the uncertainty affected Chorus differently to the other LFC partners as data about individual area targets by date is not provided publicly. However, Northland (non-Chorus) had met 100% of the target connection numbers by Q2 2014, while close demographic and economic comparator Gisborne/Hawkes Bay (Chorus) has reached only 27% of its target by this date. By Q1 2015, only 35% of the Gisborne/Hawkes Bay target had been reached. Over the same period, Waikato (non-Chorus) had gone from 64% to 80% of the target, whilst Otago (Chorus) – likewise a potential comparator – had gone from 44% to 50%.

In hindsight, it appears most unlikely that the government intended the changes to the regulatory processes to play out in the manner observed when initiating the PPP in 2008. Given the absence of any clear precedents to guide thinking about the implications of the structure of PPPs for UFBs, the most likely explanation is that none of the parties anticipated the regulatory change,²⁶ so none of them addressed it when negotiating the agreements. However subsequently, the government appears to have taken opportunistic advantage of the fact that the PPP arrangements placed most of the financial risks of a copper price reduction on the partners, and Chorus in particular. As it became increasingly clearer that overruling the regulator or compensating Chorus in any other way for the costs incurred would be politically very costly, the government appeared to become more resolved to shift the costs of the regulatory decision onto Chorus and its shareholders. Thus, the government's position shifted from the Prime Minister's bold announcements in 2012 that it would intervene to protect the achievement of the initial UFB objectives to the exertion of its bargaining power in the July 2014 renegotiations to make it quite clear that Chorus would face financial penalties if it was required to draw down the loans early to complete its side of the agreement. It may be no coincidence that a General Election was scheduled to take place on September 20, 2014.

The end result was that the government acted opportunistically to hold up Chorus (and to a lesser extent its UFB Co partners), just as surely as if a private party in a classic PPP had bid low and then increased the price once the public party had committed. There is no doubt that the regulatory change, and the government's response to it, substantially increased the cost of building the New Zealand UFB, relative to that expected when the terms were agreed. The bulk of the additional financial costs have been borne by Chorus shareholders, although taxpayers will take longer to be repaid by the UFB Co partners as uptake of their networks was also delayed. It is somewhat ironic, therefore, that the change in Chorus's shareholding meant that much of the additional financial cost was shifted from taxpayers, who would have borne them if the eventualities had been foreseen and managed with contract terms, to many of the same individuals as investors in the institutional funds purchasing the shareholdings quit by foreigners. It is the new owners who bore the higher costs, foregone dividends and the risks that Chorus will need to draw down the loans early under the renegotiated agreement. It is difficult to see this outcome being in the long term interests of New Zealanders generally. However, was certainly in the political interests of the public party to the agreement, which managed to distance itself from being seen to financial bail out the politically unpopular Chorus immediately prior to a general election.²⁷

The bigger cost, however, which cannot be measured easily in financial terms, is likely the foregone welfare from an earlier and more aggressive uptake rate of fibre connections than has occurred. As Fig. 1 illustrates, the fibre uptake rate stagnated for two years

²² <http://www.stuff.co.nz/technology/digital-living/60199775/chorus-gets-178m-ufb-loan-offer.html>.

²³ <https://company.chorus.co.nz/share-price>.

²⁴ <http://www.stuff.co.nz/business/industries/10077009/Chorus-holds-onto-BBB-credit-rating>.

²⁵ Personal communication, October 2014.

²⁶ Although Heatley and Howell (2010c) presages it, so it was not entirely unanticipated in the minds of at least some industry observers.

²⁷ The government was returned at the election with an increased majority.

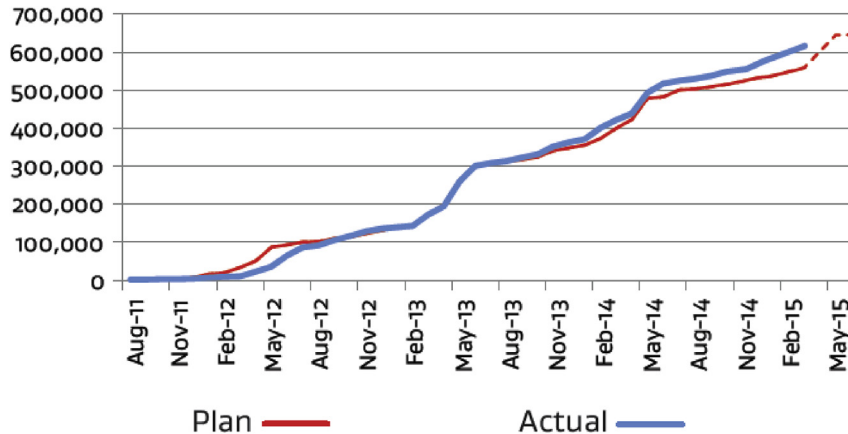


Fig. 3. UFB users able to connect by Q1 2015.

(Source: MBIE Broadband Deployment Update March 15, <http://www.mbie.govt.nz/info-services/sectors-industries/technology-communications/fast-broadband/documents-image-library/mar15-quarterly-broadband-update.pdf>)

while the copper access price remained uncertain. It appears to be only after the copper pricing matter was resolved that fibre uptake rates began to accelerate. If the purpose of the government's investment policy was to increase economic growth by accelerating fibre uptake, then the failure to provide a quick and certain resolution to the dispute has had the diametrically opposite effect. Potential economic growth was deferred for two years whilst the large investments, both public and private, in deploying fibre laid comparatively idle and the major PPP partner suffered a substantial loss in capital value. Had the UFB contracts contained terms requiring favourable renegotiation in the event of government opportunism of the form exhibited in the New Zealand case, then both of these costly consequences would likely have been avoided.

5. Insights and conclusions

The New Zealand UFBI PPP case study illustrates that there are very clear differences between the 'classic' BOOT PPPs observed in roading and UFB PPPs. Government financing of infrastructure part or fully-owned ultimately by the private partner 'unbundles' the elements that characteristically confer economic advantages on classic PPPs. Furthermore, the exposure of the private partner's (typically sunk) investments to the vicissitudes of subsequent government actions (e.g. regulatory changes) increases the likelihood that the private party will be subject to 'hold up'.

This appears to arise from the government's actions as network funder being separated from the actions of the regulator, leading to the potential for conflicts or gaps to appear between the use of contractual undertakings to regulate the partners' activities on the newly-subsidised UFB network and other regulatory activities governed by other means (e.g. legislation). Unless the government as new network funder can credibly commit to restrain the actions of the government (or its agents) as regulator (or the public party is itself strictly subordinated to control by the regulator, as occurs in local and municipal ventures within a wider national context), then the private party is subject to opportunistic hold-up. If no such commitment is forthcoming, then the pre-contractual resolution is for the private party to include explicit terms in the PPP agreement requiring the public party to compensate it if the legislative and/or regulatory terms do change during the life of the project. Only then is it possible for the financing and operational environment incentives controlled by the public party to be aligned with the incentives of the private party whose sunk assets are exposed. Clearly the exact terms will differ depending upon the quantity and type of assets brought to the agreement, and the risks involved.

The New Zealand case also shows that it is insufficient to rely upon an alignment of the public party's original UFB policy objectives with the long run outcomes of the partnership. Whilst the public party may utilise the soft budget constraint to ensure that the project delivers to its original technical specifications, it is equally possible that the public party will exercise its position of power to 'hold up' the private party and potentially sacrifice the achievement of the original objectives if it is politically more advantageous to do so. In either case, the project will end up being more costly overall than if the opportunism did not occur in the first place. In sum, therefore, this paper contributes to the small but growing body of analysis of PPPs in the area of very high capacity NGA networks. These PPPs differ from the classic PPP arrangements (e.g. roading) because direction of funding and ownership are reversed, unbundling the financing of the project from design, operation and ownership. They are complicated because the assets the partners bring to the partnership are typically sunk, and therefore more likely to be subject to hold-up than those of a classic BOOT partner. Strategic hold-up can occur if the public party cannot ensure that the regulatory settings will not change part way through the project.

To achieve credible regulatory commitment, institutional theory suggests a) to embed the regulatory systems into the licences of private companies and/or b) to make the process by which regulatory decisions are to be taken more specific (Levy & Spiller, 1994). Whilst this regulatory risk has always been a challenge for telecommunications investors, the PPP offers a mechanism, via the contract terms, to pass the costs of this risk onto the public partner alone, rather than being shared between the two parties. If the

potential for opportunism is anticipated ex ante and terms to address it are not included in the original agreement, then the public partner is best placed to reproduce the effect of regulatory commitment as per Levy and Spiller (1994) for the duration of the partnership. By the time the risk has crystallised, and renegotiation is necessary, the public party's objectives may have changed, so it cannot be guaranteed that the private party's interests will be addressed. Alternatively, it may be advisable for the proposed terms of PPP agreements to be reviewed independently by the regulatory authority to identify and address any potential conflicts between the contract terms and the regulator's ability to give credible commitments to both public and private sector investors over the period the contract is in force.

The comparison between roading PPPs and PPPs in the area of very high networks provides new insights into the role of private partners during the development of these networks. As in the initial phase of the PPPs, sharing of ownership between private partners (bidding for the right to operate and to build the project) and public partners (taking up responsibility for designing and financing) is vital for the project, the roles of private and public partners are changing during the growth of the project. As sunk assets supporting other products and services are brought to the partnership by the private party, the public party can “hold up” the private party in ways not usually observed in roading PPPs, when project finances are the assets brought initially by the private party. The different sources of “hold up risk” mean that new forms of openness about conditions of future regulated access as well as new transparent models about changes in demand are required to avoid costly consequences such as evidenced in the New Zealand case.

Appendix A. Supplementary data

Supplementary data related to this article can be found at <http://dx.doi.org/10.1016/j.telpol.2018.05.001>.

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