

Howell, Bronwyn; Sadowski, Bert

Conference Paper

Anatomy of a Public-Private Partnership: Hold-up and regulatory risk in an NGN PPP

20th Biennial Conference of the International Telecommunications Society (ITS): "The Net and the Internet - Emerging Markets and Policies" , Rio de Janeiro, Brazil, 30th-03rd December, 2014

Provided in Cooperation with:

International Telecommunications Society (ITS)

Suggested Citation: Howell, Bronwyn; Sadowski, Bert (2014) : Anatomy of a Public-Private Partnership: Hold-up and regulatory risk in an NGN PPP, 20th Biennial Conference of the International Telecommunications Society (ITS): "The Net and the Internet - Emerging Markets and Policies" , Rio de Janeiro, Brazil, 30th-03rd December, 2014, International Telecommunications Society (ITS), Calgary

This Version is available at:

<https://hdl.handle.net/10419/106872>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.



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

Anatomy of a Public-Private Partnership: Hold-up and Regulatory Risk in an NGN PPP

Bronwyn Howell* and Bert Sadowski**

October 2014

Paper to be presented at the International Telecommunications Society 20th Biennial Conference in Rio de Janeiro, Brazil, 30 November to 3 December 2014.

**Bronwyn Howell is Research Principal of the New Zealand Institute for the Study of Competition and Regulation and a member of the School of Management, Victoria Business School, Victoria University of Wellington.*

***Bert Sadowski is Associate Professor in the Department of Industrial Engineering and Innovation Sciences at Eindhoven University of Technology. In 2011 he was the ST Lee Fellow at the New Zealand Institute for the Study of Competition and Regulation.*

The authors acknowledge the helpful comments of Ronald Fischer, Justus Haucap, Dave Heatley and Richard Meade. The views in this paper represent those of the authors and do not necessarily represent those of the institutions with which they are affiliated.

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 necessary if faster and more capacious Next Generation Networks (NGNs) are to be constructed in a timely fashion. The relevant question for policymakers is how that public investment will take place. The preferred approach in most cases appears to be to by way of Public-Private Partnerships (PPPs) where public and private actors collaborate in NGN investment, construction and operation. However, the body of analysis of NGN PPPs to guide policy-makers is scant.

This paper addresses the gap by applying the learnings from classic, more mature PPPs (e.g. roading) and applying them to the NGN context. We use a case study of New Zealand’s Ultrafast Broadband Initiative PPPs – one of the first nationwide partnerships undertaken – to illustrate the relevance of the insights. We find that NGN PPPs reverse the typical direction of financing and ownership observed in roading PPPs. The bundling of design, financing construction and operation of classic PPPs is ‘undone’ in NGN PPPs, as financing and asset ownership are separated, increasing the potential for misalignment of incentives and the likelihood that the public party can hold up the private party once existing network assets are sunk in the partnership by altering regulatory settings. 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 endeavour to include terms in the initial agreement ensuring that the public party is penalised if such an event occurs (i.e. an automatic right to favourable renegotiation or payment of compensation) so that such opportunism is discouraged and the project benefits from time-consistent alignment of incentives and objectives. Had such provisions been in place in the New Zealand PPPs, costly consequences of regulatory change threatening the completion of the NGN would have been avoided.

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 Next-Generation Networks (NGNs), uncertainties about how demand for high-speed NGN connections would materialise (including consumers' willingness to pay for them), and concerns that existing regulatory arrangements were failing to provide appropriate investment incentives have led to a renewed interest in the role of governments (whether national, state or municipal) as part- or full-funders¹ of new telecommunications infrastructure (Cave & Hatta, 2009; Gómez-Barroso & Feijóo, 2010; Cave & Martin, 2010; Ragoobar, Whalley & Halle, 2011). Indeed, Cave & 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 inevitably will become NGN investors, the relevant policy issue now is determining how that investment will take place. A fundamental choice exists between returning to the pre-1980s arrangements where a government entity designs, owns, builds and operates the NGN (albeit procuring some elements from private sector during construction), and adopting a more nuanced approach where public and private actors collaborate in network investment, construction and operation (Gómez-Barroso & Feijóo, 2010; Hodge & Greve, 2007; Schleifer, 1998).

The former approach is characterised by the Australian decision to establish a fully government-funded and owned entity² (NBN Co) to deploy a fibre-to-the-home (FTTH) network to 93% of residences, supplemented by satellite and wireless connections to the remainder (Beltrán, 2013; Howell, 2012; Given, 2010). However, this arrangement 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; Sadowski, Nucciarelli & de Rooij, 2009; Nucciarelli, Sadowski & Achard, 2010; Ragoobar, Whalley & Halle, 2011). This is exemplified by New Zealand's Ultra-Fast Broadband Initiative (UFBI), where the government has partnered with four firms using two distinct

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).

arrangements to fund around one third to one quarter of the cost of building an FTTH network to around 70% of the country (Sadowski, Howell & Nucciarelli, 2013).

Despite an expressed preference for PPPs, so far there has been little formal analysis to guide policy-makers seeking to use the instrument to fund NGNs. In part, this is because most projects are only in their early stages, so it is possibly too soon to identify patterns peculiar to NGN investments. Furthermore, comparison is complicated by each project being characterised by the specific objectives of its government sponsors³, 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 NGN investments. Although “the economics of PPPs is still imperfectly understood, (as) practice has run ahead of theory” (Engel, Fischer & Galetovic, 2013, p84), it provides a logical foundation for thinking about the use of the instrument for NGN investments – 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 NGN investments, 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 costs⁴. 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).

This paper addresses the comparative lack of analysis of NGN PPPs by applying the learnings from classic (notably roading) PPPs to the circumstances of particular group of NGN PPPs – the New Zealand UFBI agreements – from their instigation in 2008 through to the current

³ Cave & 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.

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, Howell & Nucciarelli, 2012), as these have been demonstrated to be particular issues in roading PPPs. and 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 NGN PPPs than for roading projects. These warrant particular attention by both public and private sector entities contemplating the use of PPPs for NGN projects.

First, NGN PPPs such as the UFBI, reverse the typical direction of financing and ownership observed in roading PPPs. Generally, 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 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 also asset values if it crystallises after transfer of the asset to the private party has commenced. 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 NGN investments. This section identifies some key differences indicating that NGN PPPs are exposed to different risks as a consequence of both different financing arrangements and the regulatory environment governing both NGN service delivery and the other regulated markets in which assets brought to the PPP are utilised. 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.

2. PPP Theory in an NGN Context

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; Fausch, 2008; Falch & Henten, 2010). In a narrow definition favoured by the IMF, they 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, Fischer & Galetovic, 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; Ragoobar, *et al.*, 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 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 (Martimort & Pouyet, 2008; Iossa & Martimort, 2008; Bentz, Grout & Halonen, 2005). 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 JV 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, Fischer & Galetovic, 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 NGN PPPs, the question of initial and ultimate ownership of the network assets is a critical consideration. The private party is best placed, via a combination of information, experience and existing infrastructure ownership to design, build and operate the NGN. 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 NGN PPPs, where the public party part- or fully-finances the construction of a new network. Public finance is necessary because the government wishes the NGN 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 NGN (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) PPPs⁵. This has two major consequences. First, as the physical assets of the NGN PPP 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 is 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 NGN project but also those pertaining to the other activities in which the original assets brought to the partnership are applied. That is, an NGN PPP 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 NGN PPPs 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, NGN PPPs 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 it 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. Indeed, it is 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. 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 are 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

⁵ 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.

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, 2011; 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 do so.

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 – bear 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 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 NGN case, 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 NGN case, 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.

The case study of the New Zealand UFBI PPPs, which we will now explore in detail, illustrates the consequences of public party opportunism in an actual NGN 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 different arrangements governing the PPPs with different parties have resulted in a different level of cost borne by the private parties, but both are disadvantaged by the changes to the regulatory environment. 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 NGNs.

3. *The New Zealand UFBI PPP Terms*

The New Zealand UFBI PPPs have attracted much interest as they represent one of the earliest examples of shared government and private sector financing of an NGN 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 70% of New Zealand residences by 2018.

An important characteristic of the UFBI 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, Howell & Nucciarelli (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 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 be connected 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 regulated monthly fee for the right to sell UFB Co network capacity and 'over the top' services to the end consumers (partner firms are not able to be retailers themselves under the 'structural separation' arrangements in New Zealand). The capital paid by the partner for shares in the UFB Co is used to extend the footprint of the NGN into adjacent areas. Ultimately, when the entire targeted population in a defined area is able to receive services, Crown Fibre Holdings will recover 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 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 regulated 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 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 realise⁶.

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 to fund the drops from the kerb to premises and sell services to the same regulated 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

⁶ 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.

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, as intended by the government when advancing funding for the project in the first place. 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 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. 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 (Rondo & Cambini, 2011).

Likewise, it appears that Crown Fibre Holdings was also either oblivious to the potential for regulated copper prices to fall, or 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 loans. In either case, the taxpayer faces higher costs. 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 the only means of ensuring that the fibre build can be completed and salvaging the UFBI project politically. Once again, the taxpayer bears the costs. 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 acceptable. In this case, the UFB partners would have had no choice but to rely upon the good faith of the Crown to protect them from the consequences of future Crown opportunism.

4. *Regulatory Change and the New Zealand UFB PPPs*

Subsequent activities by the Crown show that it was unwise of 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 UFB PPPs were agreed between May 2010 and May 2011. The first successful tenderer for a UFB Co partnership was announced on September 9 2011. 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 UFB. 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 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 determine draft prices for copper broadband connections by December 2012, to prevail from 1 December 2014, using international benchmarking. Chorus could request the prices be determined prices using 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.

The salient point is that the legislation was consulted upon and enacted 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 it agreed to terms with no provisions concerning the effects of changes to copper regulation. Either it 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. 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 considered it to pose 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.

With the apparent purpose of the legislative changes being to primarily to regularise the changes required in the copper market primarily to address the structural separation of Telecom and Chorus, and the subsequent retention of 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 methodological change was simply a structural consideration, leaving regulated prices approximately similar to the currently-prevailing copper broadband access price. Certainly, the discussion documents associated with the changes make no mention of any substantive change in the copper price arising 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 is considered to be a quite separate consideration from the negotiation of the PPPs – justifying the determination of 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 Act, announced draft copper broadband prices from December 1 2014 some 23% lower than those at the time the PPP terms were agreed⁷. Chorus's share price immediately collapsed amidst a significant flight of foreign capital from the firm, which suggested that 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. The effect on the three UFB Co partners is

⁷ <http://www.comcom.govt.nz/dmsdocument/9695>

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).

It also appears plausible that the government did not anticipate the sharp copper price fall. The Prime Minister⁸ 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”⁹, and 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 recommendations¹⁰. 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 down¹¹.

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, and any government action would constitute a serious transgression upon the Commissioner’s position as an ‘independent’ regulator¹². A very successful public relations campaign¹³ 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”¹⁴ 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. Whilst a planned review of the regulatory environment was brought forward¹⁵, resulting review did not take place until August 2013¹⁶ (some eight months after the crisis emerged), and its recommendations

⁸ Reflecting the strategic threat to a flagship policy, the Prime Minister John Key rather than the Communications Minister Amy Adams, fronted the government response.

⁹ <http://www.radionz.co.nz/news/political/122531/pm-not-ruling-out-legislation-over-broadband>

¹⁰ <http://www.nbr.co.nz/opinion/key-reaffirms-govt-willing-overrule-commerce-commission-chorus-pricing>

¹¹ <https://www.google.co.nz/webhp?sourceid=chrome-instant&ion=1&espv=2&ie=UTF-8#q=Chorus%20Court%20Commisioenr%20broadband%20prices>

¹² <http://www.stuff.co.nz/business/opinion-analysis/8058701/Government-interference-doomed>

¹³ <http://www.stuff.co.nz/business/industries/9155840/Chorus-big-winner-in-internet-reform-Coalition>

¹⁴ <http://www.nbr.co.nz/opinion/key-reaffirms-govt-willing-overrule-commerce-commission-chorus-pricing>

¹⁵ <http://www.beehive.govt.nz/release/review-provide-certainty-consumers-industry>

¹⁶ <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>

(including to raise the proposed copper prices so that they were based upon the fibre prices)¹⁷ 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 finances¹⁸. 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 future¹⁹.

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 now intends Chorus alone to bear the full costs of the regulatory change. Chorus can now bring forward from 2019 to 2017 the drawing down of government loans in order to meet its projected cash flow shortfalls. However, if it takes advantage of this facility, it faces an interest rate penalty²⁰.

The costs to Chorus are substantial. Its share price has fallen from a post-separation high of around \$3.70 to a low of \$1.30 in January 2014, following release of the financial review (\$1.90 on October 17 2014)²¹. Its credit rating was downgraded by Moodys to Baa3 (its lowest investment-grade rating) and Standard and Poors to BBB (maintaining a negative outlook)²². A substantial proportion of its foreign investors have quit, so that now over 50% of its shares are owned by New Zealand investors²³ who are predominantly institutional. Ironically, given the extent to which New Zealand's welfare arrangements are dominated by state provision, many are in fact 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 – are bearing costs that they would

¹⁷ <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>

¹⁸ <http://www.beehive.govt.nz/release/ernst-amp-young-australia-undertake-chorus-assessment>

¹⁹ http://www.beehive.govt.nz/sites/all/files/121213_EY%20Independent%20Assessment%20of%20Chorus_Report.pdf

²⁰ <http://www.stuff.co.nz/technology/digital-living/60199775/chorus-gets-178m-ufb-loan-offer.html>

²¹ <https://www.nzx.com/markets/NZSX/securities/CNU?icharts=true>

²² <http://www.stuff.co.nz/business/industries/10077009/Chorus-holds-onto-BBB-credit-rating>

²³ Personal communication, October 2014.

otherwise have borne directly had the Chorus PPP included terms to compensate Chorus in the event of government opportunism.

In hindsight, it appears most unlikely that the government intended the changes to the regulatory processes to play out in the manner observed. Given the absence of any clear precedents to guide thinking about the implications of the structure of PPPs for NGNs, the most likely explanation is that none of the parties anticipated the regulatory change²⁴, so none of them addressed it when negotiating the agreements. However subsequently, the government appears to have taken advantage of the fact that the PPP arrangements placed most of the 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 appears to have become more resolved to shift the costs of the regulatory decision onto Chorus and its shareholders. Thus, the government's position has 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.

The end result is that the government has 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, has substantially increased the cost of building the New Zealand NGN, relative to that expected when the terms were agreed. The bulk of the additional costs are being borne by Chorus shareholders, although taxpayers will take longer to be repaid by the UFB Co partners as uptake of their networks is delayed. It is somewhat ironic, therefore, that the change in Chorus's shareholding means that much of the additional costs are being 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 bear the higher costs, foregone dividends and the risks that Chorus will need to draw down the loans early under the renegotiated agreement. Therefore it is difficult to see that this outcome is in the long term interests of New Zealanders generally. However, it certainly is in the political interests of the public party to the agreement.

²⁴ Although Heatley & Howell (2010c) presages it, so it was not entirely unanticipated in the minds of at least some industry observers.

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 NGN 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 government regulation increases the likelihood that the private party will be subject to ‘hold up’. It is not clear that an independent regulator reduces the risk of disadvantageous regulatory changes occurring, as ultimately the public party controls both policy and legislation governing regulatory activity.

As the public partner cannot credibly commit either itself or its successors not to change the regulatory settings, the resolution is for the private party to include explicit terms in the PPP agreement requiring the public party to compensate it if the regulatory terms do change. 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 NGN 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 objectives, 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 sum, therefore, this paper contributes to the small but growing body of analysis of NGN PPPs. NGN PPPs differ from the classic BBBO (e.g, roading) PPPs 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 changes regulations part way through the project. 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. However, the potential for opportunism must be anticipated ex ante and terms to address it included in the original agreement, because by the time the risk has crystallised, and renegotiation is necessary, the public party’s objectives may have changed.



References

- Beltrán, F. (2013). Effectiveness and efficiency in the build-up of high-speed broadband platforms in Australia and New Zealand. *Communications and Strategies* 91: 35-55.
- Bentz, A., Grout, P., & Halonen, M. (2005). *What Should Governments Buy from the Private Sector—Assets or Services?* Working paper, University of Bristol.
- Bortooti, B., Cambibi, C., Rondi, L., & Spiegel, Y. (2011). Capital structure and regulation: do ownership and regulatory independence really matter? *Journal of Economics and Management Strategy* 20(2): 517-64.
- Cambini, C. & Rondo, L., (2012). Capital structure and investment in regulated network utilities: evidence from EU telecoms. *Industrial and Corporate Change* 21(1):73-94.
- Cave, M., & Hatta, K. (2009). Transforming telecommunications technology – policy and regulation. *Oxford Review of Economic Policy* 25: 488-505.
- Cave, M. & Martin, I. (2010). Motives and means for public investment in nationwide net generation networks. *Telecommunications Policy* 34(9): 505-12.
- Cheung, E., Chan, A. & Kajewski, S. (2012). Factors contributing to successful public private partnership projects. *Journal of Facilities Management* 10.1 :45-58.
- European Commission (2009). Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. *Mobilising private and public investment for recovery and long term structural change: developing Public Private Partnerships*. Brussels 19.11.2009 COM (2009) 615 final.
- European Commission. (2004). *Green paper on public–private partnerships and community law on public contracts and concessions*. (COM(2004) 327 final).
- Engel, E., Fischer, R., & Galetovic, A. (2013). The basic public finance of public-private partnerships. *Journal of the European Economic Association* 11(1):83-111.
- Engel, E., Fischer, R., & Galetovic, A. (2009). *Soft Budget Constraints and Renegotiations in PPPs*. NBER Working Paper 15300.
- Falch, M., & Henten, A. (2010). Public-private partnerships as a tool for stimulating demand in broadband. *Telecommunications Policy* 34(9): 496-504.
- Falch, M., & Henten, A. (2008). Investment dimensions in a universal service perspective: next-generation networks, alternative funding mechanisms and public-private partnerships. *Info* 10(5/6): 33-45.
- Fausch, R. (2008). *Public-private partnerships: definitions and trends*. Presentation at School of Management, Zurich University.
- Gillett, S., Lehr, W. & Osorio, C. (2004). Local government broadband initiatives. *Telecommunications Policy* 28(7): 537-58.
- Given, J. (2010). Take Your Partners: Public Private Interplay in Australian and New Zealand Plans for Next-Generation Broadband. *Telecommunications Policy* 34(9): 540-8.
- Gómez-Barroso, J., & Feijóo, C. (2010). A conceptual framework for public-private interplay in the telecommunications sector, *Telecommunications Policy* 34(9): 487-95.
- Guasch, J-L. (2004). *Granting and Renegotiating Infrastructure Concessions: Doing it Right*. The World Bank.
- Hart, O. (2003). Incomplete contracts and public ownership: remarks, and application to public-private partnerships. *The Economic Journal* 113(486): 69-76.
- Heatley, D. & Howell, B. (2010a). *Structural Separation and Prospects for Welfare-Enhancing Price Discrimination in a New ‘Natural Monopoly’ Network: comparing fibre broadband proposals in Australia and New Zealand*. Wellington, New Zealand: New Zealand Institute for the Study of Competition and Regulation. Available on http://iscr.org.nz/f580.16593/16593_Efficiency-raising_price_discrimination_with_postscript.pdf.
- Heatley, D. & Howell, B. (2010b). *Revised Separation Boundaries May Partially Address Pricing and Uptake Limitations in New Zealand Fibre Broadband Model, but Significant*

- Competition Policy Problems Remain*. Wellington, New Zealand: New Zealand Institute for the Study of Competition and Regulation. Available on http://www.iscr.org.nz/f594,16948/16948_Current_Comment_UFBI_2_0.pdf .
- Heatley, D., & Howell, B. (2010c). *Submission on Regulatory Impacts of Structural Separation*. http://www.iscr.org.nz/f607,17391/Heatley_Howell_Regulatory_Implications_Final.pdf .
- Hodge, G., & Greve, C. (2007). Public-private partnerships: an international performance review. *Public Administration Review* 67(3): 545-58.
- Howell, B. (2013). *Broadband Regulation and Government Investment in Nationwide UltraFast Fibre Broadband Networks: Evidence from New Zealand*. Paper presented at the 24th European Regional Conference of the International Telecommunications Society, Florence Italy. Available on http://www.iscr.org.nz/f909,23676/ITS_2013_Broadband_Regulation_Evidence_from_New_Zealand_v2.pdf .
- Howell, B. (2012). *Competition and Regulation Policy in Antipodean Government-Funded UltraFast Fibre Broadband Markets*. Paper presented at the Telecommunications policy Research Conference, Arlington, Virginia, September 2012. Available on http://www.iscr.org.nz/f777,21321/TPRC_2012_Antipodean_Competition_and_Regulation_policy_B_Howell.pdf .
- Iossa, E. & Martimort, D. (2008). *The Simple Microeconomics of Public-Private Partnerships*. Working paper, University of Toulouse.
- Martimort, D. & Pouyet, J. (2008). To build or not to build: normative and positive theories of private-public partnerships.”, *International Journal of Industrial Organization* 26: 393-411.
- Nucciarelli, A., Sadowski, B. & Achard, P. (2010). Emerging models of public-private interplay for European broadband access: evidence from the Netherlands and Italy. *Telecommunications Policy* 34(9): 513-27.
- OECD (2007). *Communications Outlook 2007*. Paris: Organisation for Economic Co-operation and Development.
- Ragoobar, T., Whalley, J. & Harle, D. (2011). Public and private intervention for next-generation access deployment: possibilities for three European countries. *Telecommunications Policy* 35(9-10): 827-41.
- Sadowski, B., Howell, B. & Nucciarelli, A. (2013). Structural separation and the role of Public-Private Partnerships (PPPs) in New Zealand's UFB Initiative. *Communications & Strategies*, 91(3rd quarter 2013), 57-80.
- Sadowski, B., Nucciarelli, A. & de Rooij, M. (2009). Providing incentives for private investment in municipal broadband networks: evidence from the Netherlands. *Telecommunications Policy*, 33(10-11), 582-595.
- Shleifer, A. (1998). State versus private ownership. *Journal of Economic Perspectives* 12(4): 133-50.
- Williamson, O. (1976). Franchise bidding for natural monopolies—in general and with respect to CATV.” *Bell Journal of Economics*, 7, 73-104.
- Williamson, O. (1985). *The Economic Institutions of Capitalism*. The Free Press.