

# **The effects of the UCLL contribution to the UBA aggregate on competition for the long-term benefit of end-users in New Zealand telecommunications markets**

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## **Executive Summary**

1. This paper differs in two fundamental ways from my previous paper for the NZCC on the IPP for the incremental UBA portion of the UBA aggregate (Vogelsang, 2013):
  1. First, because the current paper is not concerned with the incremental UBA portion the potential unbundling investment by Telecom plays much less of a role. Rather than being affected by a UCLL price increase the amount of unbundling investments affects the outcomes of the UCLL price increase.
  2. Second, the current paper is not concerned with the uncertainty in estimating the UBA costs and therefore not with errors in estimation. It therefore does not balance effects of a too high price with effects of a too low price. Rather, it is only concerned with the effects of an intermediate input price increase in the UCLL portion of the UBA aggregate.
2. As a result of an increase in the UCLL portion of the UBA aggregate a retail price increase for copper-based services is probably unavoidable. The RSP market is not perfectly competitive and therefore there will be at least some cost pass-through. Unlike in the case of an increase in the incremental UBA portion a price increase in the UCLL portion of the UBA aggregate is likely to be associated with at best a small QoS increase for copper-based services (due to out-migration of lower-QoS RSPs). There can be small interactive effects between a price increase in the UCLL portion of the UBA aggregate and the level of the incremental UBA portion. These effects concern different levels of migration and changes in QoS.
3. Due to the interaction with other markets the price increase in copper-based services will trigger additional migration from copper to other services. This migration will lead to lesser price increases than those for copper-based services for at least three reasons. First, the other markets do not experience similar cost increases. Second, the UFB network providers cannot increase their wholesale access charges. Third, the other markets provide only for imperfect substitutes for copper-based services. They are also in competition with each other and therefore impacted by the unaltered UFB wholesale access charges.
4. The LTBEU will be negatively affected by the price increase in copper-based services. In particular, the negative effects of higher UBA charges on the LTBEU of UBA-based services accrue for a long time even for those users that ultimately switch to UFB and forever for those users not willing or able to switch. Those customers switching to other services will be partially, but not fully compensated (shown by a revealed preference argument). Furthermore, those customers already on the other services will also suffer from (albeit smaller) price increases.

Thus, overall the price increase of the UCLL portion of the UBA aggregate does not lead to an increase in competition for the LTBEU.

5. The UCLL price increase could, however, carry some further positive welfare effects worth considering. These include, in particular, innovation effects on UFB and potential spillovers on other markets and the whole economy and conventional network externalities from migration to new services. While the innovation effects are likely to occur, they are also likely to be small and will be less pronounced in areas, where Chorus is not the UFB provider. One can argue that the subsidized UFB build-out reflects a political decision about the value of the spillover effects. Overall, in my view, the positive network externality effects of a UCLL price increase for UFB subscribers are likely to exceed the negative externalities imposed on remaining subscribers of copper-based services.

**I. The NZCC has asked me for advice on the following:**

1. The New Zealand Commerce Commission (NZCC) is currently in the process of determining cost-based prices for the unbundled copper local loop (UCLL) and unbundled bitstream access (UBA) telecommunications services. UCLL and UBA are both wholesale access services supplied by Chorus Limited, which owns and operates the copper access network in New Zealand.

The NZCC is required to set forward-looking cost-based prices for the UCLL and UBA services using a total long-run incremental cost (TSLRIC) approach.

2. In my paper dated 5 July 2013 (Vogelsang, 2013) in paragraphs 42 and 31c I indicated that increasing a price could only be beneficial to welfare if quality changes:

42. In case of a price increase there may be wasteful duplicate unbundling investment, which would be prevented by a price decrease. Such duplicate investment, however, is less wasteful to the extent that it helps improve service quality offered by RSPs. Nevertheless, it makes a UBA price reduction improve efficiency as compared to a price increase

31.c) To the case where duplicating investments are undesirable from a social welfare perspective even if they may be privately profitable. This could happen if the increase in costs from duplication outweighs the potential consumer benefits from price reductions caused by increased infrastructure competition

3. In light of these comments the NZCC is seeking an economic opinion on the following questions:
  - 3.1 How the UCLL contribution to the UBA aggregate affects inter-network competition. This includes copper-based services, UFB, cable and (potentially) mobile networks.

3.2 In particular, would an increase in the UCLL regulated price promote competition between networks for the long-term benefit of end-users (LTBEU)?

3.3 Any other advice required by the NZCC.

## **II. Interpretation of paragraph 2 above**

4. The Vogelsang (2013) paper addressed UBA price increases or decreases for the portion of the UBA price that is incremental to the UCLL price. In contrast, the current paper is only concerned with the UCLL portion of the aggregate UBA price. Effects that are only due to the total UBA price are common to both portions and therefore carry over from my previous to the current analysis. With respect to the two quotes in paragraph 2 above the question is if they apply to both portions of the aggregate UBA price or not.
5. The first quote (from paragraph 42 of Vogelsang, 2013) refers to potentially wasteful duplicate unbundling investment triggered by a UBA price increase. Such unbundling investment allows an access seeker to bypass the incremental UBA portion of the UBA service, not the UCLL portion. The unbundling investment is therefore triggered by a high price for the incremental portion, not by a high price for the UCLL portion of the UBA aggregate. If anything, a high price for the UCLL portion could lead to less unbundling investment if the resulting higher UBA price triggers faster migration from copper-based to UFB-based services. The high UCLL price could, however, trigger additional investment in bypass loops, such as cable investment. While such bypass investment could lead to price reductions and could increase overall consumer choice, it is unlikely to materialize significantly in view of Chorus' subsidized UFB build-out. We will nevertheless treat this issue in connection with the competitive effects of an increase in the UCLL portion of the UBA service on other networks. Such bypass investment could also be viewed as wastefully duplicate if it comes in addition to UFB investment. On the other hand, it allows for product differentiation that is appreciated by end-users and it can lead to lower end-user prices than those incurred without the bypass competition. It will, however, even at high UBA prices be insufficient to make UBA regulation superfluous.
6. The second quote (from paragraph 31c of Vogelsang, 2013) refers to the application of the ladder-of-investment approach to the New Zealand UBA pricing context. It makes the point that duplicative investment may be socially undesirable even if it is privately profitable. Competition would only eliminate duplicative investment if there is a natural monopoly and if competition is sufficiently fierce. Without the natural monopoly property even fierce competition should not eliminate duplicate investment. If it did it would be anti-competitive. However, with the natural monopoly property duplicate investment can only occur under sufficiently soft competition. Now, the duplicative investment will itself normally increase the fierceness of competition. Because of sunk costs this will generally not lead to exit. The question then is if the pro-competitive effects of the investment outweigh the additional costs imposed on society by duplication. The pro-competitive effects can include price reductions and quality-of-service (QoS) increases.

### III. The players

7. In order to answer the above questions 3.1 and 3.2 one has to develop conjectures about the likely behaviour of the main players involved and about the likely interactions between them.

#### Legacy network

8. The central player in the legacy network is Chorus, who offers the regulated UBA service and will in the future offer (unbundled) wholesale access to its UFB network. A main behavioural question regarding Chorus' wholesale UBA price is whether Chorus will actually charge the higher price under question 3.2 if allowed to do so. There could be two reasons why Chorus may actually charge a lower price (or threaten to charge a lower price). The first is that Chorus faces *actual* competition from other UBA providers bypassing Chorus' UBA service. The second is that Chorus faces *potential* UBA bypass competition, which Chorus wants to pre-empt. For the time being we assume that Chorus actually charges the allowed UBA price (throughout the country).
9. The next important player is Telecom who, as a retail service provider (RSP), has the largest market share in the traditional copper-based market and who is the largest buyer of Chorus' wholesale UBA service. From the end of 2014 onwards Telecom is free to buy wholesale UBA services elsewhere and/or to invest in unbundling in order to bypass wholesale UBA in favour of UCLL (and in order to offer wholesale UBA to others).
10. The third important players are the other potential wholesale access seekers, a number of whom have already unbundled in the more densely populated areas of New Zealand. Since they did so under the current high UBA charges, which are expected to be lowered substantially, I would expect little further unbundling investments from these players independent of where the final UBA pricing decision actually comes out.

#### Alternative networks

11. The UFB market is of particular future importance, since it has been the subject of extensive planning and subsidization. It is important to note that Chorus is the UFB provider in some areas and in other areas Chorus is not the UFB provider.
  - In areas where Chorus is not the fibre provider, Chorus' copper network will potentially be competing with the fibre network.
  - In areas where Chorus is the UFB provider at a contracted price Chorus is operating both the fibre and copper networks. Chorus requires approval from Crown Fibre Holdings (CFH) to increase its UFB wholesale charges.<sup>1</sup> CFH indicated to the RSPs that they will not approve any increase for UFB wholesale charges. Chorus, does however, have the ability to decrease its UFB wholesale charges.

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<sup>1</sup> CFH has been established to manage the Government's \$1.5 billion investment in UFB infrastructure.

12. Vodafone's cable network is an important competitor, both for copper-based services and for UFB, but it is geographically limited in New Zealand to Wellington, Christchurch and Kapiti.
13. A recent merger investigation found that mobile broadband is currently not an effective constraint to fixed line broadband. This distinction may become more blurred as mobile broadband capacity increases. The NZCC's view in the UBA IPP was that the roll out of LTE mobile networks is more likely to be driven by rivalry between the mobile operators rather than by the opportunities from fixed to mobile substitution.
14. Since we are only considering the competitive effects of an increase in the UCLL portion of the UBA price, we will for most of the discussion keep the extent of unbundling investments by potential wholesale UBA buyers constant. This is reasonable in spite of the effect mentioned in paragraph 5 above, given that the effect of the UCLL portion of the UBA price on unbundling investments should be of second-order magnitude. However, we will consider in paragraph 37 below in three scenarios whether the extent of unbundling investments would change the competitive effects of the UCLL portion. To give an example, if the incremental UBA portion is very high and therefore Telecom invests in a lot of unbundling then this may affect how fierce the retail competition in copper-based services is going to be. These effects will be taken from Appendix II. Other than (a) through its effects on wholesale competition between Chorus and unbundlers for the incremental UBA portion and (b) through unbundling investments the incremental UBA portion has no different competitive effect from the UCLL portion. Thus, unless noted otherwise, we will simply look at the effects of an increase in the UBA price.

#### **IV. Step 1: Effects of the UCLL portion of the UBA price on competition for copper-based products only**

15. The analysis of the competitive effects of an increase in the UCLL portion of the UBA aggregate on inter-network competition involves two steps. The first step concerns an analysis of the intra-network effects on price, quantity and quality of the UBA-based end-user services. The second step then traces the *inter*-network effects resulting from the *intra*-network effects. These two steps, however, are not consecutive in time but rather occur simultaneously, leading to a joint market equilibrium for all the markets concerned.
16. For the purpose of this report we assume that the increase in the UCLL portion of the UBA price is non-trivial but not drastic. A trivial increase would not have significant effects. A drastic increase would not be compatible with the TSLRIC price base and with s18 (see Appendix I). The assumed increase in the UCLL portion of the UBA wholesale price affects all sellers of copper-based products similarly in all areas where Chorus is the only provider of copper access. Thus, while the wholesale price change may trigger some competitive responses, it is questionable if in the long run the wholesale price increase will change the level of competition for copper-based services. Thus, we can expect a retail price increase, the actual magnitude of which will depend on the extent of downstream competition and on possible changes in the extent of

downstream competition. The wholesale price change represents a straightforward change in marginal costs for all RSPs.

17. We first take the extent of market competition as given. Under perfect competition the wholesale price increase would lead to an equal price change in the retail market price, provided the market supply curve is horizontal. Otherwise, under perfect competition the amount of pass-through will depend on the relative slopes of market demand and market supply curves. Under monopoly and oligopoly there will generally be a partial pass-through which, in the simple case of symmetric homogeneous Cournot  $n$ -firm oligopoly amounts to an  $n/(n+1)$  share of the cost increase (Ten Kate and Niels, 2005). In the differentiated product case the amount of pass-through in addition depends on cross elasticities and is also strictly greater than zero and not greater than one.<sup>2</sup>
18. Could the wholesale price increase change the extent of market competition downstream? This could happen, for example, if the cost change is large enough to affect the market structure. To wit, if the retail price increase leads to a noticeable reduction in market output and if firms in the market face significant fixed costs then the wholesale price increase can trigger the exit of firms. If this happens the actual pass-through of the wholesale price increase to the retail market can exceed 100% because the reduction in the number of competitors triggers a higher price. How likely is such a reduction in the number of competitors? If the copper-based retail market were totally isolated it would be quite unlikely. However, to the extent that copper-based products face competition from cable, UFB and mobile services, the outcome on market structure appears at least possible. Working against this is that, at least for the unbundlers, most of the fixed costs will also be sunk, so that market structure effects are likely to be asymmetric. The fixed costs will affect entry but not exit. As a result, a price reduction in the end-user market will only trigger those downstream firms' exit that have not incurred any significant sunk costs, and only a large price increase in the end-user market will trigger downstream firm's entry. We can therefore comfortably conclude that there will be only exit of firms without unbundling investment and that could have a small positive effect on the QoS for copper-based services. Below and in Appendix II we argue that firms with unbundling investment achieve higher QoS than firms without such investment. Thus, when firms without such investments leave the industry, average QoS rises.
19. My preliminary conclusion is therefore that the increase in the UCLL portion of the UBA price will lead to significant increases in the copper-based retail prices, unless constrained by inter-modal competition. Because of migration of RSPs without significant sunk investments there could be a small compensating effect on QoS.

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<sup>2</sup> A pass-through greater than one usually pre-supposed non-profit-maximizing behavior, but it can also happen as the result of reduced competition if the cost increase triggers the exit of firms from the market. In a symmetric Hotelling oligopoly the cost pass-through is one if all firms experience the same cost increase. Such a symmetric cost increase is similar to a parallel shift of all Hotelling lines.

#### **IV. Step 2: Effects of the UCLL portion of the UBA price on competition in the markets for other products**

##### General effects on all types of markets and feed-back effects

20. Any competitive effects on the markets for other products of a price increase in the UCLL portion of the UBA price will come solely from the cost pass-through in the markets for copper-based products. Since the other products (UFB, cable and mobile) are substitutes for copper-based services, a price increase in copper-based services will shift outwards the demands for these other products. Unless these other services are perfectly competitive with a horizontal supply curve, this outward demand shift will lead to price increases for these other products. These price increases will vary by the extent of substitutability with the copper-based products and by the competitiveness in these other product markets (assuming that they form their own markets).
21. The interaction between various numbers of firms in several markets is usually too complex for analytical oligopoly models. In the past I have therefore collaborated in several numerical market simulations capturing rather similar, although not identical, situations to those found in the current context (Hoernig et al., 2010, 2011, 2012a and 2012b; Neu et al., 2012; Neumann and Vogelsang, 2013).<sup>3</sup> I here only provide some qualitative results. Somewhat surprising was that these inter-modal competition effects can be quite strong.<sup>4</sup> In particular, in the arguments above we have not taken feed-back effects into consideration, while the numerical modelling effort does so by seeking Nash equilibrium outcomes. That means, for example, that an increase in the price of copper-based services leads to an increase in the demand for cable-based services, but the resulting price increase for cable services increases demand for copper, which allows for a copper price increase, and so on, and so on, leading to an equilibrium outcome for all services. Compared to the “first-round effect” this outcome carries a higher price for the copper-based services and a lower price for the cable-based services. As a further result, profits of the providers of the other services will increase accordingly, while profits of the copper-based retail service providers will fall.<sup>5</sup> Last, the relative outputs (“market shares”) of the other services increase while the relative outputs of the copper-based services decrease. In a dynamic sense therefore the increase in the UCLL portion of the UBA charge will boost inter-modal

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<sup>3</sup> The main difference to the New Zealand context is that in these numerical models the incumbent wholesale provider is vertically integrated into retail and therefore competes in the end-user market with the wholesale access seekers. In New Zealand the incumbent wholesale provider does not offer end-user services. Under vertical integration into end-user services the incumbent would charge itself (by imputation) an opportunity cost instead of the access price for the wholesale service. This opportunity cost is usually smaller than the access charge but larger than the marginal cost of providing the wholesale service to itself (DeGraba, 2003). Since the incumbent in New Zealand is vertically separated, there is no such imputation problem. Rather, the UCLL price increase treated in the current paper is simply a cost increase for downstream firms like any other cost shock that is the same for all firms in that particular market.

<sup>4</sup> See, for example, figures 2-22, 2-25, 2-26, and 2-28 in Hoernig et al. (2010).

<sup>5</sup> This does not always hold. If there are few firms in an industry, each with significant fixed costs, then the exit of a firm can increase overall profits significantly.

substitution away from copper-based services. In the numerical model runs overall consumer welfare significantly decreases from such a wholesale price increase, while total surplus decreases very little. The latter is the result of using a Hotelling-type model, where aggregate output is either fixed or only depends mildly on price (the latter in so-called hinterland models). This could well hold for the sum of New Zealand telecommunications markets, though.

22. The numerical simulation-results critically depend on certain parameter values. These parameters are (a) the amount of horizontal product differentiation,<sup>6</sup> (b) the amount of vertical product differentiation,<sup>7</sup> and (c) the cost differences between firms. Together with prices and quantities the values of (a) and (b) determine own and cross-elasticities of demand. In general, the flatter the Hotelling lines, the fiercer competition. In particular, with flatter lines cost advantages and vertical product differentiation advantages translate into larger market advantages than with steeper lines. Since the UCLL price increase creates a cost disadvantage for copper-based services, its effect on other services will depend on how close substitutes these services are. If they are close substitutes copper-based services will lose more customers than if they are more remote substitutes. Among the three other markets high-speed cable may be a closer substitute for copper-based services than UFB, which in turn is a closer substitute than mobile services. Thus, we expect stronger effects of the UCLL price increase on cable than on UFB and much stronger effects than on mobile services. Naturally, there are also inter-market effects between cable and UFB and mobile services which, in general, increase the pass-through effects.
23. While the numerical simulations give us a good feel for the results of interactions, they do not provide robust numerical policy prescriptions. The reasons are two-fold. First, the input numbers for parameters and variables of the models, although based on analytical cost models and rough demand estimates, are not tailored to the New Zealand situation. Second, the underlying theoretical models are highly stylized and only incompletely capture the competitive situations found in actual markets.
24. Could the actual market outcomes be qualitatively different from the numerical simulation-results derived from price competition with horizontal and vertical product differentiation? In particular, could the supplier of a substitute product, such as cable or UFB in an area without Chorus' UFB presence, decide to lower rather than increase its price in response to the price increase in copper-based products? This would certainly speed up substitution away from copper. However, it would only be profitable if the alternative network's demand would shift out and, at the same time, become more elastic as a result of the copper price increase. This appears to be very unlikely.
25. To the extent that a price increase in the copper retail market will trigger price/penetration increases in the markets for the other networks there will also be positive

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<sup>6</sup> In Hotelling models horizontal product differentiation is represented by the slopes of the Hotelling lines.

<sup>7</sup> In Hotelling models vertical product differentiation is represented by the vertical intercepts, at which the Hotelling lines start for each supplier.

innovation/investment effects for these networks. Under s18 this could be interpreted as being in the LTBEU (see Appendix I). Competitive interactions may dampen this effect. Furthermore, given the subsidies provided for UFB investments (including the high UBA price for Chorus until end of 2014) and the contracts the UFB investors entered into, the positive effects on innovation will be substantially smaller than otherwise (Vogelsang, 2013, paragraph 4).

26. Increased migration from copper-based services to UFB could also generate positive externalities. These can take the form of spillover effects on other markets and the economy in general and of classic network externalities. Spillover effects would be very similar to those mentioned in Vogelsang (2013), paragraphs 45 and 46:

45. The conventional view is that there are large spillover effects from fiber adoption. The main question is if those are already fully reflected in the subsidies granted to the UFB investors. Since New Zealand is a small country, its spillover effects on software developments or the like may be smaller than in large countries.

46. A decision not to consider such spillover effects therefore has good justifications. Such spillover effects are hard to assess. As a result the decision about incorporating spillover effects should be left largely to politicians and the legislature. This has in fact happened in New Zealand, because the UFB build-out is deliberately subsidized. One can argue that the subsidized build-out reflects a political decision about the value of the spillover effects. Spillover effects from UFB investments come in two forms. Most direct are spillovers in the form of network effects on new applications that directly benefit the UFB subscribers. Such effects are not taken into consideration in the subscription decisions of potential new subscribers, leading to too few subscribers. In contrast, more indirect spillovers affect the economic growth of a country via improvements in productivity and the like. While one can argue that the latter indirect effects should be the concern of the central government, a case can be made for the former direct effects to be the concern of the Commerce Commission both with respect to the LTBEU and efficiencies gained for the telecommunications sector. As a result innovation incentives and risks faced by investors could potentially justify a UBA price above the true cost. In contrast, a UBA price below true cost has to be seen as conflicting with the goals of s 18.

27. Besides such spillovers there could be conventional network externalities from having more subscribers on a particular technology over which they can communicate. For example, Skype requires certain speed. One could imagine an advanced version of Skype that would require UFB. In that case, the more people migrate to UFB the more valuable becomes that version of Skype to them and thus the more valuable becomes the UFB network to all subscribers. Thus, it is the existing UFB subscribers who benefit from the additional migration.

28. One can argue that such externalities are also part of the LTBEU. They relate to the increased UFB (and high-speed cable) penetration that exerts positive externalities on the old UFB (and high-speed cable) subscribers. At the same time, copper-based services lose network

externalities. Both, the externalities gained and lost relate more to programming than to classical telephone network externalities of reaching other subscribers. Subscribers to copper-based services may, for example, find that as a result of consumer migration to the UFB their Internet browsers are becoming slower, because they are being loaded with more and more information. Or, such subscribers may find it more difficult to buy CDs, because that content can now be downloaded over high-speed lines. Overall, in my view, the positive network externality effects of a UCLL price increase are likely to exceed the negative ones.

#### Interim conclusions

29. On a general level we can expect that a wholesale UCLL price increase will trigger an end-user price increase for copper-based services that can be as high as the UCLL price increase. Price increases for cable and UFB services will be less, and that will attract some additional migration to these services. There will be some innovation and net positive externality effects from the migration. Innovation benefits will come from the financial benefits for other networks and for content providers serving these networks. Additional externalities will accrue to the pre-existing subscribers of these services, who benefit from the additional or cheaper content made available to them.

#### **What differences do we expect for the specific other markets mentioned above?<sup>8</sup>**

##### UFB with Chorus as the fiber provider

30. Specific to Chorus as a UFB wholesale provider is that the UBA prices can affect UFB revenues and penetration via the resulting end-user prices or via the attractiveness of the UBA vs. the UFB wholesale markets.<sup>9</sup> This issue is famously treated in Bourreau, Cambini and Dogan (2012), who distinguish between three effects of wholesale pricing of the old technology on the deployment of the new technology by an integrated incumbent.

1. Under the *wholesale revenue effect* an increase in the wholesale price of the old technology reduces the incentives to invest in the new technology because such investment cannibalizes wholesale profits. Because of this effect an increased wholesale charge for the old technology will make the old technology more attractive to Chorus than the new technology. This effect should be less relevant for Chorus' UFB investment because of the incumbent's commitment to invest in UFB. The wholesale revenue effect is only important to the extent that Chorus can renege on their investment commitment. However, as discussed below, a similar effect should be relevant for the RSPs' decisions to switch from DSL to UFB. In the current case the wholesale revenue effect may be tampered or increased by revenue shifts from UCLL wholesale to UFB wholesale (via the business migration effect below).

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<sup>8</sup> Part of the following sub-sections are adapted from Vogelsang (2013, paragraphs 40-50).

<sup>9</sup> We are here not treating the direct effect of UBA prices on the profitability and the financing ability of Chorus.

2. The *replacement effect* induces alternative investors (the RSPs or cable companies) to invest in the new technology. This calls for high wholesale charges as an umbrella for such investments. Again, this effect is less important for New Zealand, because such alternative investments are handicapped by the UFB subsidies. Any replacement effect would be very local, e.g., in Vodafone's cable areas.
  3. Last, the *business migration effect* captures the effect of wholesale charges on consumer prices and consumer willingness to switch to the new technology. In the current case the business migration effect appears to be the most important one.
31. How large is the business migration effect? While higher prices for copper-based services clearly could induce end-users to switch to UFB services, it is hard to predict the extent to which that will occur. New telecommunications services are experience goods so that the speed of adoption depends on the experience of previous adopters. Price has played a role in the spread of other new technologies, such as mobile services and ordinary broadband. However, as shown in the penetration literature<sup>10</sup> the price effect is only one of several, such as the QoS and the availability of complementary appliances and services. Thus, while a positive migration effect can be expected from an increased UBA charge, the size of the effect is highly uncertain.
32. Along with the business migration effect goes an RSP migration effect. Under the current legal framework Chorus is unable to increase its wholesale access charge for fiber. As a result, due to increased demand the UFB retail activity becomes highly attractive for access seekers, leading to entry of RSPs into this market (and some exit from copper-based services). Such entry may compete away the excess profits available from the demand shift and therefore keep any retail price increase for UFB at bay. If this leads to major migration from copper to UFB this may compensate a large part of the negative consumer welfare effects from increased copper prices. Under rational consumer behavior it is, however, unlikely that it will lead to full compensation, because otherwise the consumers would have switched to UFB without the copper price increase. Under a revealed preference argument they could have switched without or before the copper price increase if that really made them better off.<sup>11</sup> In addition, in spite of the additional RSP entry in the UFB market the UFB retail price is likely to be higher than before. It is likely, because of the outward shift in demand. It is not certain, because the additional competition could also be associated with capturing scale economies or saving on advertising costs.
33. Seen from the copper perspective the effect of higher UBA charges on RSPs is a future lessening of business opportunities relative to UFB wholesale. Here we can see first a quantitative effect from the consumer migration and second a margin effect from the different wholesale charges for UBA and UFB unbundling relative to the consumers' willingness to pay (WtP) for the copper

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<sup>10</sup> For example, see the penetration literature for mobile services cited in Vogelsang (2010).

<sup>11</sup> If Chorus were able to increase its UFB wholesale access charge then Chorus could collect the extra rents available, leading to less migration to UFB than discussed above. There could also be a mixture of the two effects if Chorus has a big interest in moving end-users from copper to UFB.

and UFB products. Whether this is an additional effect to the one already described in the last paragraph depends on the competitiveness of the two end-user markets. To the extent that Telecom can make use of its scale economies it will continue to have some advantage in the copper markets. It is not clear that it can carry this advantage over to the UFB markets. This is a potential advantage of the switch to UFB for the other RSPs and that could make the downstream market for UFB potentially more competitive than for copper and may lead to a push into this market that could compensate part of the above price effects.

#### UFB where Chorus is not the fiber provider

34. In these markets the other UFB providers (known as local fibre companies = LFCs) are in a situation similar to that of Chorus in its UFB markets. They also have to leave their wholesale UFB charge at its previous level and only benefit from the migration effect of the higher UCLL portion of the aggregate UBA charge. At this point I see little difference to the previous outcome, given the UCLL related UBA wholesale charge increase. The situation between the case where Chorus is the UFB provider and where it is not would differ significantly only if both the UFB charge and the UCLL charge were jointly optimized by Chorus. Here, however, they are both treated as exogenous.
35. However, another difference of potential relevance is that in its own UFB area Chorus will likely shut down the copper-based network if the (expected) profit from operating the UFB network alone exceeds the sum of profits of operating the two networks in parallel (plus some shutdown costs). Such shutdown can happen even if the copper network remains profitable, since the shutdown will reduce competition and induce further customer migration to the UFB network. In contrast, Chorus will not shut down its copper network in areas where it does not provide UFB, unless the copper network becomes unprofitable. Thus, an increase in the UCLL portion of the aggregate UBA price will in the areas where Chorus is not the UFB provider lead to a later shutdown of the copper network than in those areas where Chorus is the UFB provider (*ceteris paribus*). In addition, the LFCs face Chorus as a formidable copper competitor who may undercut the regulated wholesale UBA price cap, because on account of sunkness Chorus' forward-looking costs will be much below the TSLRIC. Chorus could here follow a limit-pricing strategy, trading off an accelerated (inevitable) loss in market share against higher markups on UBA cost. Thus, the question is if the envisaged increase in the wholesale price of the UCLL portion of the UBA aggregate is still below Chorus' profit-maximizing price taking into consideration its effect on the future price and quantity path.
36. Furthermore, the effects of a UBA price increase on the financing ability for UFB investment differs substantially between Chorus and the LFC areas. For Chorus in its own UFB investment areas there is a direct effect from its UBA revenues plus an indirect effect via the penetration of UFB affected by the UBA price, while for the LFCs in their areas there is only the latter indirect effect. This implies that a UCLL price increase has a lesser innovation effect on UFB in markets, where Chorus is not the UFB provider than where it is.

### Vodafone's cable network

37. The cable network would certainly want to increase its retail prices and increase its market share.<sup>12</sup> However, since the wholesale UFB price is held steady, the UFB retail price may also change little. Thus, the extent to which the cable retail price will change depends (a) on the cross-elasticities between cable and copper and between cable and UFB, (b) and on the fierceness of competition between UFB retailers. Furthermore, similar arguments as for unbundlers hold for investors in alternative technologies (other than the subsidized UFB). Past investments here are largely sunk. New investments are handicapped by the subsidized UFB. As a consequence an increase in the UCLL portion of the UBA price is unlikely to increase investment in the footprint of alternative technologies, because those are impeded by Chorus' commitment to the UFB build-out and by the associated government subsidies. My judgment is therefore that cable may have little possibility to increase its price, but may increase its market share in its current coverage areas.<sup>13</sup>

### Mobile networks

38. At this time mobile networks will be the least affected by the UCLL price increase. The first reason, as noted above, is limited price-based substitution. The second is that competition between mobile networks is unlikely to allow mobile networks to increase their prices. As a consequence I would only expect some additional migration to mobile networks, again not fully compensating the welfare loss of switching end-users for the copper price increase.

### The likely effects of different wholesale charges for the incremental portion of the UBA charge

39. In Appendix II we derive some relationships between the incremental portion of the UBA charge and unbundling investment and deal with some consequences for retail competition. In this context the following three likely cases emerge, which could be associated with different consequences for the effects of a UCLL charge increase :

1. A low price for the incremental UBA portion combined with low unbundling investment
2. A high price for the incremental UBA portion combined with high unbundling investment, leading to high copper retail prices because of high QoS
3. A high price for the incremental UBA portion combined with high unbundling investment, leading to low copper retail prices because of a price war (in spite of high QoS).

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<sup>12</sup> In my numerical simulation models that was a rather consistent outcome.

<sup>13</sup> Since cable is a very localized service, Chorus may in cable areas keep its UBA charge at a lower than the allowed level.

- Ad 1. Under the first case with little unbundling the overall UBA charge would be low and therefore also the amount of migration from copper to other networks would be at a fairly low level. Starting from this basis an increase in the UCLL portion of the UBA charge would not change the fierceness of copper retail competition, which is likely to be in the range between oligopolistic and competitive. This would lead to a copper price increase somewhere between 50% and 100% of the UBA price increase. Because of the low level of unbundling investment migration of UBA access seekers to UFB would have minor improving effects on the QoS in copper-based retail markets.
- Ad 2. Under the second case with a high amount of unbundling the starting UBA price would be higher than in the previous scenario. In spite of the QoS increase for copper services associated with unbundling investment the initial migration away from copper would already be higher than in the previous case.<sup>14</sup> An increase in the UCLL portion of the UBA would then again trigger a further price increase for copper-based services, again in the 50% to 100% range. It is unclear if this accelerates migration to other networks compared to the previous case or not. The reason for this ambiguity is that “[t]o the extent that the high UBA price will trigger additional unbundling this will raise the cannibalization issue mentioned above. At the high price level for copper-based services caused by the high UBA charge the unbundling RSPs will be very reluctant to switch to UFB, because their unbundling costs are sunk whereas they would have to pay for UBA if they switch to UFB” (Vogelsang, 2013, paragraph 68). The question therefore is if a price increase in the UCLL portion of the UBA price will overcome this effect or not. If it does there will be migration of RSPs away from copper-based services. This will be largely by firms without unbundling investments so that QoS for copper-based services should increase.<sup>15</sup> Thus, the same amount of migration will have a stronger effect on increasing the QoS of copper-based services than in the previous case.
- Ad 3. Under the third scenario Chorus’ UBA price may be lower than the allowed UBA price and therefore the initial level of migration away from copper is likely to be low. Since the unbundlers depend on the wholesale UCLL product and since downstream competition in the market for copper-based services is fierce, the UCLL price increase will be largely passed through, leading to major migration away from copper, again with positive QoS effects for the remaining customers.

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<sup>14</sup> In Vogelsang (2013, paragraph 37) I wrote: “Thus, we can expect that most of the UBA price reduction will be passed on to final consumers, while part of a UBA price increase will be buffered by additional unbundling investment of Telecom.” This did not take into consideration additional QoS-increasing effects for Telecom from unbundling investment.

<sup>15</sup> As mentioned in paragraph 5 above, an increase in the UCLL portion of the UBA aggregate could lead to reduced unbundling investment by Telecom, because the increased migration to UFB makes copper unbundling investments less attractive.

In summary, there are some interactive effects between the price for the UCLL portion and the price for the incremental UBA portion of the aggregate UBA service. In particular, the extent of migration and the change in QoS of copper-based services may be affected. In my view, these interactive effects are likely to be small, though.

## V. Conclusions

40. This paper differs in two fundamental ways from my previous paper for the NZCC on the IPP for the incremental UBA portion of the UBA aggregate (Vogelsang, 2013):

1. First, because the current paper is not concerned with the incremental UBA portion the potential unbundling investment by Telecom plays much less of a role. Rather than being affected by a UCLL price increase the amount of unbundling investments affects the outcomes of the UCLL price increase.
2. Second, the current paper is not concerned with the uncertainty in estimating the UBA costs and therefore not with errors in estimation. It therefore does not balance effects of a too high price with effects of a too low price. Rather, it is only concerned with the effects of an intermediate input price increase in the UCLL portion of the UBA aggregate.

41. As a result of an increase in the UCLL portion of the UBA aggregate a retail price increase for copper-based services is probably unavoidable. The RSP market is not perfectly competitive and therefore there will be at least some cost pass-through. Unlike in the case of an increase in the incremental UBA portion a price increase in the UCLL portion of the UBA aggregate is likely to be associated with at best a small QoS increase for copper-based services (due to out-migration of lower-QoS RSPs). There can be small interactive effects between a price increase in the UCLL portion of the UBA aggregate and the level of the incremental UBA portion. These effects concern different levels of migration and changes in QoS.

42. Due to the interaction with other markets the price increase in copper-based services will trigger additional migration from copper to other services. This migration will lead to lesser price increases than those for copper-based services for at least three reasons. First, the other markets do not experience similar cost increases. Second, the UFB network providers cannot increase their wholesale access charges. Third, the other markets provide only for imperfect substitutes for copper-based services. They are also in competition with each other and therefore impacted by the unaltered UFB wholesale access charges.

43. The LTBEU will be negatively affected by the price increase in copper-based services. In particular, the negative effects of higher UBA charges on the LTBEU of UBA-based services accrue for a long time even for those users that ultimately switch to UFB and forever for those users not willing or able to switch (Vogelsang, 2013, paragraph 4). Those customers switching to other services will be partially, but not fully compensated (shown above by a revealed preference argument). Furthermore, those customers already on the other services will also

suffer from (albeit smaller) price increases. Thus, overall the price increase of the UCLL portion of the UBA aggregate does not lead to an increase in competition for the LTBEU.

44. The UCLL price increase could, however, carry some further positive welfare effects worth considering. These include, in particular, network externalities and innovation effects on UFB. While the innovation effects are likely to occur, they are also likely to be small and will be less pronounced in areas, where Chorus is not the UFB provider. Overall, in my view, the positive network externality effects of a UCLL price increase for UFB subscribers are likely to exceed the negative externalities imposed on remaining subscribers of copper-based services.

#### **Appendix I: Interpretation of s18 (from my previous paper for the NZCC)**

45. To the extent that the price determination method can be fulfilled in different ways or leaves otherwise room for discretion the choice of the Commission has to follow the considerations provided by s 18.
46. s 18 first (s 18 (1)) specifies the promotion of competition in telecommunications markets for the “long-term benefit of end-users” (LTBEU) of telecommunications services as the objective of this part of the Telecommunications Act. Competition is usually considered the best means for solving the complex tradeoff between quality, price and investment to best meet consumer demand. Thus, the UBA price determination would first and foremost have the objective of promoting competition. While the promotion of competition is clear, the additional requirement “for the long-term benefit of end-users” seems to indicate that there could be (regulation-induced) competition that is not providing long-term benefits for end-users. At least this possibility would have to be checked by the Commission.
47. s 18 (2) further specifies that any efficiencies likely to result from decisions of the Commission have to be taken into consideration. While the LTBEU only concern one side of the market, the efficiencies concern suppliers and others (like software developers) as well. Customarily the consideration of efficiencies would therefore allow for some tradeoffs between consumers and suppliers. However, that would defeat the objective described in the previous paragraph. My view therefore is that the efficiency considerations only apply if there is more than one way to satisfy the objective of promoting competition for the long-term benefit of end-users.
48. This is further explained in s 18 (2A), which interprets the consideration in case of doubt to apply to “the incentives to innovate that exist for, and the risks faced by, investors in new telecommunications services that involve significant capital investment and that offer capabilities not available from established services”.

#### **Appendix II: The effect of the incremental UBA portion on retail competition**

##### No change in QoS from unbundling

49. The duplicate unbundling investments mentioned in Vogelsang (2013, paragraphs 31 c and 42) relate predominantly to Telecom. While we can therefore concentrate on Telecom’s potential

unbundling investments, the other potential wholesale access seekers compete with Telecom downstream and that will feed back into Telecom's investment decision.

50. We start with the assumption that Telecom's unbundling investment would not change the level of horizontal or vertical product differentiation in the downstream market. We also assume that downstream competition is in prices and takes place after the unbundling investment has been made if any. Furthermore, unbundling investment is assumed fully sunk, while wholesale UBA access is sold on a per customer basis. Under these assumptions Telecom's unbundling investment will make downstream competition fiercer, because Telecom's price-relevant marginal costs drop from the wholesale access price down to zero. If the unbundling investment occurs because of a higher UBA wholesale access charge there would be two effects compared to the status quo ante. The higher wholesale access price would increase the opportunity costs at the retail level, but the additional unbundled capacity would have the opposite effect. The opportunity cost argument is analysed in DeGraba (2003).<sup>16</sup> The argument depends on whether Telecom can sell the UBA service to its competitors or not and at what price. Thus, the opportunity cost is affected by competition with Chorus and other unbundling investors, who may lower their wholesale UBA charge.<sup>17</sup> Depending on which effect is larger, the competition-increasing effect or the opportunity cost effect, the retail price for copper-based services may be higher or lower than before.

51. Our arguments so far were based on a given level of Telecom's unbundling investment. However, this is a two-stage game with the investment decision in the first stage and the pricing decision in the second stage. If, in the second stage, the retail price turns out to be low the unbundling investment would very likely not be profitable. Thus, the investment depends on whether Telecom expects the resulting retail price for copper-based services to be low or high or, in other words, whether Telecom expects the opportunity cost effect or the competition-increasing effect to dominate. Thus, Telecom will not invest if it expects the resulting competition to be fierce ("puppy dog ploy"). High investment by Telecom would therefore be a signal that Telecom expected post-investment competition in the market to be soft. We therefore would also expect under Telecom's high unbundling investment that competition in copper-based markets will be rather soft and therefore the end-user price will increase if the wholesale UBA charge goes up, but we cannot be certain about that.<sup>18</sup> However, there is also the chance that Telecom's expectations are not fulfilled and a price war results for wholesale unbundling services and/or for copper-based retail services.

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<sup>16</sup> DeGraba does not analyze competition between wholesale suppliers, though.

<sup>17</sup> The Sappington (2005) argument about make-or-buy decisions does not work here, because Chorus does not compete in the end-user market. However, Telecom would have to make an assessment about its investment decision on the likely UBA price and the end-user price.

<sup>18</sup> We have assumed price competition, which is fiercer than quantity competition. Under quantity competition wasteful duplication can occur in natural monopoly (Knieps and Vogelsang, 1982). However, quantity competition is today interpreted as competition in capacities. In the UBA case there could exist capacity restrictions for individual firms, but there is excess capacity in aggregate.

52. Any short-run effects are likely to be mixed. While it will take some time for competitors to respond to the UBA price increase with their end-user prices, it will also take time for Telecom to do the unbundling investments. However, as argued above, even a UBA price increase relative to the UBA cost will most likely stay well below the current UBA price (valid before the current UBA pricing review).
53. An evaluation of unbundling investments depends substantially on the welfare approach taken. Under a total surplus approach any further unbundling has an inherent inefficiency property for UCLL markets. It is, what I have called a “sunk cost natural monopoly” (or ex post natural monopoly; Vogelsang, 2003). If an incumbent has made a sunk investment then its forward-looking costs are reduced by the amount of sunkness. Thus, forward-looking there is a natural monopoly if the current market structure is less costly to operate than a market structure with additional new firms. This argument extends to a natural oligopoly if, for example, other firms have already invested in additional unbundling. Thus, the usual argument under a total surplus approach that increased consumer prices are compensated by higher profits (or lower costs: Williamson tradeoff, which is reversed here) does not hold for consumer welfare as the yardstick if there is a sunk cost natural monopoly or natural oligopoly. Even if the investment were privately profitable it would not be good enough, because the investment under the above assumption does not generate any consumer benefit if it does not lower end-user prices. This may change if unbundling investment increases horizontal and/or vertical product differentiation. Then both consumer surplus and total surplus may actually increase as a result of the wholesale access charge increase.

#### Change in QoS from unbundling

54. Ceteris paribus it is fairly safe to conjecture that full vertical integration provides for the highest QoS, while UCLL offers a little less QoS and UBA the least QoS. Compared to full vertical integration, because the value chain under UCLL is partially predetermined by the incumbent and because entrants depend on the incumbent for service and repairs, slightly poorer quality may result. The value chain in case of UBA access is strongly dependent on the incumbent. Any bandwidth guarantee per customer is limited or dependent on statistical behavior. The handover at core locations is poorer than at MPoPs.
55. We therefore assume now that unbundling investment leads to increased horizontal and/or vertical product differentiation. All other assumptions remain the same. In that case a price increase compared to the case without a QoS increase is likely to occur. However, in contrast to the previous case this price increase is associated with a shift in demand functions that affects consumer welfare besides the price effect. This shift in demand can more than compensate consumers for the higher price. It also has the effect of increasing the likelihood that the investment will actually occur, because the investing firm can expect a higher price and larger output (both in terms of market share and in terms of market expansion).

#### Conclusions on the competitive effects of unbundling investments

56. The conclusions on the competitive effects of unbundling investments are as follows. First, the amount of unbundling investments is likely to increase in the incremental portion of the UBA charge. Thus, it is advisable to differentiate two cases, one with a low incremental UBA portion and low unbundling investment and one with a high incremental UBA portion and high unbundling investment.<sup>19</sup> Second, the effect of higher unbundling investment on retail competition involves tradeoffs between higher quality, a higher associated UBA charge and lower marginal costs of the firm investing in unbundling. In my view, the two former effects will dominate as long as Chorus will actually be able to maintain the higher UBA charge (because of the opportunity cost effect).<sup>20</sup> This would also be the rational expectations outcome. However, a potential second scenario under the case of high unbundling investment would show a price war in the UBA wholesale market, leading to lower retail prices and to lower income for Chorus. Thus, we may want to differentiate three cases:

1. A low price for the incremental UBA portion combined with low unbundling investment
2. A high price for the incremental UBA portion combined with high unbundling investment, leading to high copper retail prices because of high QoS
3. A high price for the incremental UBA portion combined with high unbundling investment, leading to low copper retail prices because of price war (in spite of high QoS).

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<sup>19</sup> There could also be a high incremental UBA portion of the UBA aggregate associated with low unbundling investment. This would result if Telecom expected fierce competition in copper-based services (wholesale and/or retail).

<sup>20</sup> This scenario with high unbundling investment would show Telecom with a higher retail market share than under low unbundling investment.

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