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by Brian Williamson

If you want fibre...
should you lower the price of copper?

Europe needs an infrastructure migration solution

Motivated by a desire to deliver high speed broadband to European citizens there is an active debate in Europe over how copper and fibre should be regulated during the transition to fibre. The rhetorical title of this paper is based on a proposition promoted by some in Europe – the price of copper should be lowered, it is claimed, in order to promote fibre investment.

Two broad approaches have been pursued globally in relation to fibre deployment – state financing and deregulation. In Europe the first is ruled out by the poor state of public finances in a number of countries and by limitations on financing of commercial activities by member states (under so called State Aid rules). The second option, pursued in the US post 2005, would necessarily have to be more nuanced in Europe given an institutional commitment to access regulation where significant market power is found.

The outcome of the above constraints has been a focus on the regulated price of copper versus that of fibre as a possible instrument to promote investment. Perhaps surprisingly, an argument that lowering the price of copper would encourage fibre investment has been promoted by some and supported by modelling by WIK Consult.[1]

This paper considers the question of investment incentives and their relationship to pricing during transition. The relationship between the price of copper and fibre investment is considered both in terms of the linkage between the prices of the two products (which are assumed to be partial substitutes) and in terms of the anticipated impact on investor expectations.

We conclude that lowering the price of copper could be expected to harm investment prospects in relation to fibre. We also conclude that allowing flexibility in relation to fibre prices could be expected to encourage investment in fibre.

What technology mix might be anticipated?

Whilst we talk about the copper fibre transition it is not a simple or immediate transition from copper to fibre. In a commercial deployment of next generation access a mix of copper and fibre may play a significant role with fibre to the cabinet (now capable of higher and more consistent speeds with the launch of commercial noise cancel-

1 For the study and a commentary on it see the following: WIK-Consult. April 2011. *Wholesale pricing, NGA take-up and competition.* http://www.ectaportal.com/en/upload/WIK/WIK%202011%20-%20Wholesale%20pricing%20NGA%20take-up%20and%20competition%20-%20Final_Report_2011_04_07.pdf
Williamson and Punton. February 2012. *Modelling the copper fibre transition - a guide for the perplexed.* http://www.plumconsulting.co.uk/pdfs/Plum_Feb2012_The_copper_fibre_transition_-_a_guide_for_the_perplexed.pdf

lation 'vectoring' technology).[2] Further, where FTTH is deployed a reasonably prolonged co-existence with copper DSL is likely (in the US Verizon have deployed fibre but have, for the most part, continued to offer DSL in parallel[3]). Finally other technologies including wireless (LTE and additional spectrum) and cable in particular locations will offer next generation access.

How would the price of copper and the price of fibre interact and impact investment?

Given that copper and fibre will coexist in any commercial deployment and that many consumers will view them as partial substitutes the price of copper (DSL) can be expected to impact on the price and or demand for fibre (including FTTC and FTTH). A lower copper price might therefore be expected to harm the investment case for fibre.

For a fibre entrant or other platform competitor the analysis is straightforward – a lower copper price would make it harder to attract existing broadband customer to the fibre network without price discounting – thereby undermining the business case for investment.

For an existing copper network operator the analysis is a little more complex given competing impacts in terms of returns on copper and on fibre from higher copper prices. In a highly idealised case where platform competition and impacts on investor expectations are put to one side, the price of copper would have no impact on the incentive to invest.

Figure 1

Incumbent's investment decision without platform competition

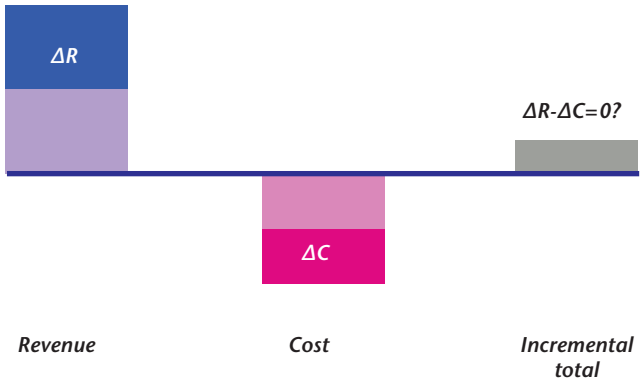

Figure 2

Incumbent's investment decision with platform competitor

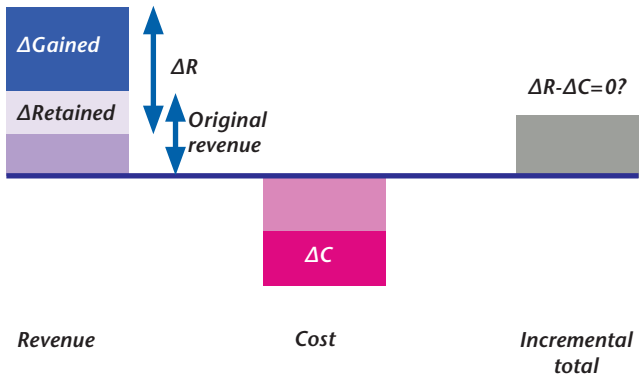

Figure 1 illustrates the idea.[4] Note that the decision over whether to invest would in addition be expected to take account of the option value of waiting i.e. the rule would be ΔR-ΔC > option value of waiting, rather than simply greater than zero.

All that matters in this simplified case is the anticipated increase in revenue (ΔR in the figure), not the existing revenue base that depends on the price of copper. In other words, in this simple and restricted analysis the price of copper has no impact on investment incentives for an existing copper network operator.

Introducing platform competition – even relatively weak platform competition – changes the above conclusion. The reason for this is that the value of retaining a customer – the full revenue associated with a customer - is now a consideration in the investment decision. Figure 2 illustrates the case of an existing copper network operator with platform competition.

In this case ΔR also includes the impact of investment on customer

2 http://www.alcatel-lucent.com/vdsl2-vectoring/

3 Five years after initial deployment of FTTH Verizon closed an exchange in Texas in 2011. Further, Verizon have followed a targeted line by line strategy making maintenance savings where customers switch to fibre, discouraging them from switching back to copper and also announcing in 2012 a targeted transition strategy for those customers with high copper line maintenance costs.

4 Williamson, Black, Punton and Horrocks. December 2011. *Copper pricing and fibre transition - escaping a cul-de-sac.* http://www.plumconsulting.co.uk/pdfs/Plum_Dec2011_Copper_pricing_and_the_fibre_transition_-_escaping_a_cul-de-sac.pdf

retention, which increases the incentive to invest if customers are more valuable i.e. if market prices for copper and fibre are higher.

In conclusion, examining incentive effects alone, we have found that a lower copper price would be unambiguously harmful for investment by entrants and platform competitors, neutral under restrictive assumptions for an existing copper network operator and harmful when platform competition and customer retention are factored into the analysis.

We now consider the additional impact via capital markets – both in terms of investor expectations and the impact on the balance sheet.

What if copper prices were conditional on fibre investment?

A more "sophisticated" argument, put forward by the European Commission in a questionnaire in October 2011, was to somehow link the price of copper to fibre investment (actual or committed). There are three questions in relation to this proposition.

First, a question of principle, namely should copper pricing be manipulated to encourage fibre investment or should efficient fibre investment be the objective? Second, how would such a linkage be implemented and work in practice? Third, what incentives would linkage introduce?

Leaving the question of principle to one side, there are practical questions regarding implementation, particularly given the degree of autonomy enjoyed by national regulators, rights of appeal and principles of cost orientation underpinning pricing.

In relation to incentives the detail matters. Would any investment contributing to the Digital Agenda targets qualify or might the copper-fibre price linkage, for example, be restricted to FTTH investment by the copper network operator. If conditionality is restricted to fibre investment by the copper network operator then this would favour incumbents over entrants; if not then the incumbent would benefit from investment by others.

Practical difficulties and potentially perverse outcomes appear likely in relation to the concept of linkage applied in an investor or technology specific way. However, a general relationship between the form of price control and changes in customer numbers during migration may involve an element of linkage and alter incentives, but with less risk of introducing perverse incentives.

How might lowering the copper price impact on investor expectations and investment?

A move to lower the price in relation to investment that has been made (variously defended on grounds that the asset is already there, is fully depreciated, is non-replicable or simply by appealing to short run incremental cost on supposed efficiency grounds) can be expected to increase investor concern that future investments will be treated similarly.

An increased expectation of future investment "stranding" is even more likely given that what has been proposed in Europe would involve a change in long established methodology (predominantly replacement cost).

The impact of an increase in the anticipated risk of stranding on investment incentives can be substantial (since the impact of a stranding risk expressed as an annual probability of stranding is equivalent to the same percentage point increase in the cost of capital).

Credible pre-commitment – rather than opportunistic changes in approach (which may well be considered optimal *ex post* when assessed in isolation) - is required to reduce or overcome this problem.[5] This problem has been understood since antiquity (the pre-commitment problem features in Homer's Odyssey from around 800 BC), yet commitment and investor expectations has been noticeably absent from much of the discussion regarding copper pricing and fibre investment in Europe.

How might lowering the price of copper impact on the balance sheet and investment?

For an idealised investment decision the balance sheet is typically not considered on grounds that funding should be available for any net present value positive investment. But both empirical evidence in relation to the market as a whole[6] and our discussions with equity analysts and investors point to two channels via which a lower copper price could harm investment via balance sheet effects.

First, a reduction in free cash flow will result in pressure to maintain dividend returns via a reduction in discretionary or non-essential investment. Second, a reduction in the ratio of debt to returns may trigger an increase in the cost of debt.

5 The circumstances are analogous to monetary policy where a commitment to low inflation (via policy targets and institutional mechanisms) is necessary to avoid the short run temptation to allow inflation to rise. The seminal paper on this issue was by Kydland, F. and E. Prescott (1977), *Rules rather than discretion: The inconsistency of optimal plans*, Journal of Political Economy 85, pp. 473-490.
6 Denis and Sibilkov. December 2011. *Financial Constraints, Investment, and the Value of Cash Holdings.* The Review of Financial Studies, 23(1).

Does the political economy of local loop unbundling offer an explanation?

Lower copper prices have not been promoted on grounds that they would benefit customers directly, but rather on grounds that they would promote fibre investment.

The above analysis, considering both static incentive impacts and dynamic impacts via capital market effects, points to a conclusion that lowering the price of copper – particularly in a manner inconsistent with established principles and practice – would be expect to decrease incentives to invest in fibre and for customers and local loop un-bundlers to migrate from copper to fibre.

The real question then is why a decrease in copper prices has been proposed? A plausible answer is that lower copper prices would benefit local loop unbundlers directly rather than investment. Benefits could come directly via improved customer retention (lower retail prices rather than margins) in the face of platform competition.

Indirectly, the fact that lower copper prices would discourage fibre investment may be viewed as a benefit given that the transition to fibre could prove disruptive for some existing competitors (though parallel running of copper and fibre increases competition and choice from a consumer perspective).

This is not to say local loop unbundling has not produced benefits, for example, in terms of retail competition and innovation and more rapid adoption of faster DSL. However, the scope for further innovation in DSL over existing line lengths is now limited and investment to extend fibre closer to the customer is required. From a public interest perspective the balance has shifted.

What should be done?

Don't reduce the price of copper on ad hoc grounds in the belief that doing so will promote fibre investment. Beyond that, in relation to copper pricing, maintaining the *status quo* in Europe (predominantly replacement cost) appears sound both in terms of consistency and signals for investment, including investment by entrants and other platforms.

However, the above leaves open the question of how to treat new fibre (FTTC or FTTH). If platform competition is sufficient then price regulation of copper and fibre should be removed. If rival platform competition is not sufficient, then the restraint provided by regulated copper on the nascent fibre market may be sufficient to discipline market conduct i.e. fibre prices need not be regulated (though a requirement for equivalence of access might nevertheless apply).

The restraint provided by a copper product can be extended to include the idea of a virtual equivalent of the copper product over fibre i.e. an anchor product (or anchor price)[7] relating to a virtual product emulating the service level of copper could provide a discipline on fibre pricing, without limiting the scope to offer more advanced and differentiated services over fibre or freedom to decide their pricing on commercial terms. It also provides customers who may not value the additional capability of fibre with a migration option, and for the investor in order to discourage fibre customers from switching back to copper which would involve switching and increased maintenance costs, provided a virtual equivalent of the physical copper anchor is provided over fibre.

It is envisaged here that active products rather than unbundled fibre would be provided at a wholesale level – otherwise the virtual anchor would appear infeasible and retail produce-price differentiation (say according to bandwidth) would be unravelled by arbitrage between fibre unbundlers.

Copper retirement should be permitted on commercial terms, but not mandated or subject to an overall plan (since it may optimally occur on a line by line rather than area by area basis, at least for some time).

Finally, to address concern regarding the possibility that as the number of customers on copper falls cost oriented prices may ultimately rise by an unacceptable amount then a simple pragmatic response might be to move to a safeguard price cap for copper which is no longer strictly cost oriented. This might include an upward transparent and predictable price glide path as a migration signal.

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7 A concept originally developed by the author and later implemented by Ofcom. http://www.broadbanduk.org/component/option,com_docman/task,doc_view/gid,944/