Access regulation on NGA – a financial, market-led solution to bridge the gap between US and European diverging regulatory approaches

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Abstract
How to regulate wholesale access on next generation access (NGA) networks is probably the most pressing issue faced by European telecoms regulators nowadays. The lack of actual competitive restraint from cable operators precludes the replication of US-alike regulatory forbearance, as it might lead to the (re-)monopolization of broadband markets by telecoms incumbents, thus spoiling the celebrated achievements over the last decade whereby competing operators have penetrated the market thanks to widespread access regulation over the DSL platform. However, as NGA networks are yet to be deployed, the threat of similar measures being extended is keeping incumbents from undertaking investments into NGA. This is particularly so given the perceived uncertainty about consumers’ willingness to pay for next-generation Internet (access) services, which raises deep reservations about the viability of the business case for NGA. Such a stalemate is exacerbated by the difficulty to envisage practical solutions to reach a “new regulatory contract”, where conflicting interest are effectively balanced out for the benefit of the society overall. This note represents an attempt to address this vacuum. A “division of labour” between regulators and the market is proposed, in order to reflect distinctive capabilities in an incentive-compatible way. In particular, while regulators would be responsible for setting wholesale access terms, the market would be left to price the risk in NGA deployment through the functioning of a commodity option market.

Keywords Next generation networks · Access regulation · Option markets · Auction · Regulatory forbearance

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1 Introduction

Regulatory-wise, the issue of next generation access (NGA) can be framed in terms of a friction between supply-side certainties and demand-side uncertainties. From a supply-side perspective, the deployment of optical fibre closer to consumers’ premises would strengthen the importance of scale and scope economies, thus potentially leading to an enduring economic bottleneck.\(^1\) From a demand-side perspective, investors face uncertainty about consumers’ willingness to pay for services that could be uniquely delivered over upgraded access networks, while traditional sources of revenues are, and will increasingly be, commoditized and cannibalized.\(^2\) This friction is challenging telecoms regulators as the conventional regulatory approach - focused on cost orientation, price control and service quality - evolved on a widely deployed infrastructure, whose cost had been largely recovered, whereas NGA networks are yet to be deployed.

In this respect, a new divide is emerging between US and EU regulatory approaches.\(^3\) In the former case, concerns about demand-side uncertainties and the degree of inter-platform competition primarily from cable companies have reshaped the regulatory approach. The previous unbundling obligations on incumbent local exchange carriers have been eliminated, thus providing them with strong incentives to undertake widespread investment plans.\(^4\)

On the other side of the Atlantic (as well as of the Pacific),\(^5\) supply-side certainties are predominantly shaping regulators’ stance toward announced investment initiatives in NGA, in the view that intra-platform competition must be safeguarded to prevent retail monopolization by fixed incumbents. However, \textit{ex-ante} regulatory intervention - or the threat of it – might spoil incentives to invest in NGA, as investors face the risk of asymmetric regulatory treatment, where returns are (not) capped under (negative) positive scenarios.\(^6\) At the same time, regulators are keen not to promote investment \textit{per se}, which might be turn out to be inefficiently too large or/and too fast.\(^7\)

\(^1\) See ERG (2007a).
\(^2\) See Alleman \& Rappoport (2007).
\(^3\) See Crandall (2007).
\(^4\) See Bauer \& Bohlin (2007).
\(^5\) The Australian regulator, ACCC, is substantially aligned to European authorities, as witnessed by the bitter dispute with the local incumbent, Telstra, over its attempt to seek temporary regulatory forbearance. See ACCC (2007a).
\(^6\) See Ofcom (2007a).
\(^7\) A parallel argument as to whether regulatory intervention is appropriate to foster investment while preserving existing competition hinges upon the issue of functional/structural vertical separation of the fixed access network. By and large, while regulatory forbearance presumes the maintenance of a vertically integrated structure, vertical separation is seen as an ancillary remedy to access regulation, in order to prevent non-price discrimination (or, “sabotage”: see Mandy and Sappington, 2007) among access seekers (ERG, 2007b). Although functional separation has been first introduced in the context of current generation Internet access - notably, in the UK with BT/Openreach - the debate on this type of remedy has gathered momentum in light of the transition to NGA. In particular, the European Commission has proposed to introduce functional separation as an available remedy to all national regulatory authorities (NRAs), while the Italian NRA has already consulted on this issue (\url{http://www.agcom.it/provv/d_208_07_CONS/d_208_07_CONS_eng.htm}). As for structural separation, the debate has recently materialised in Australia with a proposal from a consortium led by Telstra’s competitors to structurally separate the incumbent infrastructure, in order to roll out their own NGA solution (NERA, 2007). While fiercely resisted by Telstra (Ergas, 2007), ACCC invited the consortium to refine their proposal (ACCC, 2007b).
This tension is at the core of the European debate on regulatory principles of NGA and has so far precluded the development of effective and pragmatic solutions capable to balance out the incentives of fixed incumbents with the interests of other stakeholders – notably, regulators and potential access seekers. This difficulty is witnessed by the current focus on potential remedies, which have been so far envisaged mainly in terms of promoting facility-based competition – i.e. sub-loop unbundling; duct/facility sharing. This is at odds with the growing consensus that in an NGA environment the main competitive mode will take the form of service-based competition – i.e. via bitstream access. Arguably, this lack of concreteness reflects regulators’ uneasiness with demand-side uncertainties, compared to the complex but predictable technicalities of facility-based, structural remedies.

This note aims at addressing this vacuum by introducing a “division of labour” between regulators and the market in order to reflect distinctive capabilities in an incentive-compatible way: whereby regulators set the wholesale access price and the market prices risk in NGA deployment through the functioning of a commodity option market. This approach would ideally establish a communizing platform where to reach a new regulatory contract on NGA, while complying with the current European Regulatory Framework for Electronic Communications (the Regulatory Framework), which prevents regulators from entering into contingent commitments over a long period of time.

While the next Section investigates the economic aspects of NGA deployment from both supply-side and demand-side perspectives, Section 3 explains the current regulatory impasse in light of the described economic conditions. Similarly, Section 4 presents and analyses the proposal advanced in this note as a solution to the described regulatory impasse. Section 5 concludes.

2 The economics of NGA

Even though NGA is an agnostic concept, thus encompassing a number of alternative access technologies (e.g. copper/fibre; cable; terrestrial fixed and mobile wireless; satellite; and power line), the debate has univocally focussed on the upgrading of wireline access network, through substitution of copper with optical fibre, mainly undertaken by public switched telephone network (PSTN) incumbents. With this regard, two broad scenarios have been defined, according to how far fibre is rolled out towards the end-user’s premises, specifically: i) fibre to the cabinet (FTTCab), or to the node (FTTN), where the copper is maintained between the end-user and the street cabinet; and ii) fibre to the home/building (FTTH/B), which is a fully optical solution going to the end-user’s premises.

Given the intergenerational nature of NGA investments, its economics should be assessed in reference to the status quo. As regards cost conditions, there is a consensus that the deployment of NGA increases the importance of scale economies at the local level. In particular, as the principal cost category refers to (horizontal) civil engineering works, with the digging of trenches and laying of new ducts and fibre accounting for about two-third of deployment costs, scale economies would be higher at the sub-loop/street cabinet level than they currently are at the local-

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8 See ERG (2007a).
9 See Ofcom (2007a).
10 See ERG (2007a).
11 For a detailed survey of relevant business case studies, see ERG (2007, section 3.2.2).
12 Ofcom (2007a, par 4.75).
loop/local exchange level. The emergence of a natural monopoly is reinforced as the fixed cost per node due to communication equipments would need to be recouped over a smaller base of reachable subscribers/lines. Therefore, the denser the network topology at the sub-loop level (i.e. the higher the number of street cabinets per local exchange) and the tougher is the viability, and replicability, of the transition to NGA.\textsuperscript{13}

Given the significance of scale economies, the viability of the business case critically rests on the prospects regarding demand conditions, in particular, the ability to increase average revenue per user (ARPU) and the penetration rate. In this respect, the intergenerational nature of the NGA transition may generate several sources of uncertainty and, possibly, excess inertia.

As a number of business case studies show, the profitability of NGA roll-out critically depends on the ability of operators to generate higher ARPU for the services offered on these lines.\textsuperscript{14} On the one hand, moving to All-IP networks would drastically put the traditional, time-based voice-pricing model under pressure (i.e. due to the mass adoption of voice over IP - VoIP), thus potentially cannibalizing the principal revenue source of fixed operators.\textsuperscript{15} On the other hand, operators are struggling to make up for voice declining contributions at both the retail and the wholesale level.

At the retail level, operators face uncertainty about consumers’ willingness to pay (WTP) for higher performance and/or new service offerings.\textsuperscript{16} In other words, there is uncertainty about operators’ ability to command a premium for very-high broadband access services and/or find the right business model to viably mass market high-capacity services – e.g. internet broadcasting, video on demand and peer-to-peer (P2P) services.

In response to these difficulties on the retail/residential side, fixed operators may consider to charge content owners or service providers for the provision of bandwidth intensive content to end-users\textsuperscript{17} – e.g. setting tariffs at the wholesale level for termination services.\textsuperscript{18} This issue is being debated for long in the US under the label

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\item[\textsuperscript{13}] ERG (2007a, section 3.2.2.1). On the other hand, the transition to NGA may bring also cost saving both in terms of capital and operating expenditures. For example, the Dutch PSTN incumbent, KPN, is aiming at drastically reducing its cost base by dismantling its current 1,361 local exchange locations, while rolling out FTTCab to 28,000 street cabinets (OPTA, 2006). In addition, a fibre network may also offer lower operating and maintenance costs than a legacy copper infrastructure – e.g. in the US Verizon has estimated that network problems are up to 80% less for its FTTH network compared to its legacy voice and DSL services (Ofcom, 2007c, page 160). However, these cost savings would not be appropriated in case the incumbent was required to run both the new and the legacy access network in parallel.
\item[\textsuperscript{14}] See ERG (2007a).
\item[\textsuperscript{15}] See Alleman & Rappoport (2007); and McKinsey (2007). Notwithstanding this threat, the decline in fixed voice revenue may be eventually caused by fixed mobile substitution, thus leaving no choice to fixed operators to pursue new sources of revenue to offset the diminishing, traditional role of voice services. See Banerjee (2007).
\item[\textsuperscript{16}] See Ofcom (2007a).
\item[\textsuperscript{17}] See BT (2007).
\item[\textsuperscript{18}] Alternatively, there has been a call to introduce asymmetric regulatory measure on the wholesale fixed call termination rate to promote COs’ NGA investments – i.e. similarly to the introduction of rate asymmetries in mobile call termination rates to support new entrants against mobile incumbents. In particular, this proposal has been advanced by Fastweb – the Italian CO which pioneered fibre deployment in Italy: see Parisi (2007). Both the Italian NRA – Agcom – and the European Commissioner – Viviane Reading – were sympathetic with this proposal ("Asymmetric rates as a temporary measure might prove an effective incentive to build alternative fixed broadband
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of “net-neutrality”, which portrays telecoms carriers as two-sided platforms delivering access services to residential customers on the one side, and wholesale termination to application service providers on the other. Needless to say that the introduction of such a funding model is freight with uncertainty, as it would be resisted by application service providers calling for regulatory intervention to restore the status quo where no termination fee was levied.

Moreover, resistance, and ensuing funding difficulties, might also come from within the ISPs’ rank in the form of intergenerational strategic sponsorship. As competing operators (CO) – in particular, those relying on local loop unbundling (LLU) - are threatened by NGA roll-out, as their sunk investments in LLU are at risk of being stranded because obsolete, they might (rationally) react by further discounting their “old generation” offering in an attempt to counter the diffusion of incumbents’ “new generation” of Internet access services. As the premium that promoters of NGA would be able to command would ultimately be pegged to prevailing prices for broadband access services, this strategic sponsorship of the “old generation” might put downward pricing pressure for very high speed Internet access. Therefore, intergenerational strategic sponsorship might lead to excess inertia – i.e. the socially undesirable persistence of the incumbent superseded technology – thus forestalling and/or delaying the penetration of very high speed Internet access.

In a nutshell, the circumstance that large upfront investments are required ahead of an uncertain demand leads operators to call for certainty about future regulatory environment, to allow them the clarity needed to invest with confidence. As argued in the next section, European regulators are struggling to meet this request, while they have unambiguously refused to adopt the light-handed approach followed by US regulators.

3 European regulatory impasse

From a theoretical perspective, Armstrong & Sappington (2007) explain that regulatory intervention is typically portrayed in a context of asymmetric incomplete information, whereby the regulated firm has private information on its cost and/or demand conditions, thanks to, respectively, its ongoing management of the production process and its frequent contact with customers. Therefore, the design of the optimal policy intervention is aimed at addressing the ensuing problems of adverse selection and/or moral hazard.


19 For a thorough analysis see Sidak (2006). Indeed, the underlying economics strongly resembles what has instructed the European debate on regulation of mobile termination services: see Farrell & Weiser (2003); and FTC (2007, Panel 3).

20 See Koski & Kretschmer (2004). An example of excess inertia due to intergenerational strategic sponsorship may be found in the European mobile industry, where a negative relationship can be traced between the presence of mobile virtual network operators (MVNO) and the penetration of 3G/UMTS mobile telephony. In particular, MVNO’s penetration strategy through no-frills offerings over the 2G/GSM platform forestalled the diffusion of 3G, whose main penetration strategy was (counterintuitively) based on volume discounts for traditional voice and data services.

21 See Williamson (2007).

22 See Ofcom (2007a).
However, given the *ex-ante* perspective in the deployment of NGA, the strategic context shaping the debate on the corresponding regulatory principles can be described as of symmetric imperfect information, whereby both the regulator and the regulated firm are equally acknowledged about cost characteristics, but being both uncertain on demand conditions. Regarding cost conditions, since the main cost category refers to civil engineering works, there appear to be no significant information asymmetry on roll-out’s cost conditions, as witnessed by the number of business case studies quoted in ERG (2007a, section 3.2.2.).

Contrastingly, European operators lack hands-on experience of very-high speed Internet access mass-markets, and there is still uncertainty on which business model(s) will best achieve the needed degree of coordination along the value chain. On this regard, if any, regulators will contribute to shape demand conditions on at least two grounds: *i)* by dealing with the issue of COs’ stranded assets, regulators will affect the extent and intensity of excess inertia likely to be faced by NGA’s sponsors; and *ii)* regulators would ultimately be arbitrators between telecoms carriers and service/content providers in case the former tried to introduce a charge for wholesale termination services to deliver bandwidth intensive applications.

The divide between US and European regulatory approaches to NGA can be characterized in reference to which informational side is prioritized. The fundamental changes of US unbundling policy since 2003 can be seen as a response to demand-side uncertainties, whereby regulatory forbearance was introduced to further the investment incentives in NGA, while removing the potential time-inconsistency problem inherent in any temporary solution. Arguably, the US turnaround was also a direct reflection of the impact of technological convergence stimulating inter-platform competition mainly from cable operators. Under these circumstances, telecommunications policy could be less restrictively shifted from *ex-ante* to *ex-post* interventions – i.e. from regulation to antitrust.

Arguably, the lack of actual inter-platform competition, in particular, from cable operators, is the principle rationale argued by European regulators for refuting even temporary regulatory forbearance. Therefore, the described cost conditions imply that access regulation must be extended to NGA, as its roll-out would give rise to an (or, strengthen the current) enduring economic bottleneck, thus undermining the existing degree of intra-platform competition from COs, which is reckoned as the only workable competitive mode in the European broadband market. In this respect, the

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23 The insights (and caveats) from advanced markets such as Japan and Korea are in the public domain: see ITU (2007); the ITU’s Country Case Studies website, available at: [http://www.itu.int/osg/spu/casestudies/index.html#broadband](http://www.itu.int/osg/spu/casestudies/index.html#broadband); and the OECD’s Broadband Portal, available at: [http://www.oecd.org/document/54/0,3343,en_2649_34223_38690102_1_1_1_1,00.html](http://www.oecd.org/document/54/0,3343,en_2649_34223_38690102_1_1_1_1,00.html).

24 For example, see Ofcom (2007, Annex 7) for a detailed analysis of the so-called “anchor product regulation”, whereby the incumbent is requested to make available one or more products on the NGA network that replicate existing offerings to end users in terms of price and service for a period of time. Arguably, any such approach would be unwelcome to COs, as it would not rescue their stranded assets, but turn their sunk fixed costs into (monthly) variable one. Indeed, this approach is mainly envisaged to protect end-users by maintaining the (virtual) availability of the “old generation” product at the same (wholesale) price.


26 See Bauer (2005); and Weisman (2005).


28 See Kahn (2006); and Shelanski (2007).

29 See ERG (2007a).
bitter dispute between the European Commission and the German incumbent, DT, in reference to the operator’s call to be temporary exempted from unbundling regulation in regards to its plan to roll-out FTTCab is a case in point.\textsuperscript{30} In July 2007, despite the extensive coverage of cable networks (about 80% of total households), the DSL platform accounted for about 95% of the German broadband market, with cable at just 4.5%.\textsuperscript{31} Therefore, it appears that the European Commission has focussed on the degree of actual inter-platform competition, thus dismissing the potential competitive restraints from cable operators.\textsuperscript{32}

However, a more nuanced argument stresses the endogeneity in access regulation, as the more friendly it is to COs and the more it might crowd out investments in alternative infrastructure. Therefore, the promotion of intra-platform competition might prevent the emergence of inter-platform competition, thus perpetuating the case for maintaining access regulation.\textsuperscript{33} An in-between approach postulates a geographically differentiated treatment,\textsuperscript{34} whereby access regulation should be withdrawn in so-called 2-X areas: that is, where cable competition is present.\textsuperscript{35} While this approach would allow prices to more closely reflect underlying competitive conditions and therefore costs, as facility based competition typically locates in densely populated residential areas,\textsuperscript{36} it might be socially undesirable as it would lead

\textsuperscript{30} The European Commission acted on two fronts. On the one hand, it has taken the German legislator to the European Court of Justice, in reference to a law granting DT a so-called “regulatory holiday”, which bypassed regulatory scrutiny at both the European and national level (http://europa.eu/rapid/pressReleasesAction.do?reference=IP/07/595&format=HTML&aged=0&language=EN&guiLanguage=en). On the other hand, the EU Commission lobbied the German regulator, BNetzA, within the Regulatory Framework - i.e. as it (still) lacks veto power on proposed remedies (http://www.europa.eu/rapid/pressReleasesAction.do?reference=IP/07/876&format=HTML&aged=0&language=EN&guiLanguage=en).

\textsuperscript{31} European Commission (2007a; page 41).

\textsuperscript{32} Other important elements to be taken into account are the fragmentation of the German cable market and the penetration of digital cable: that is, the potential for ready infrastructure competition due to the coverage of two-way hybrid-fibre-coaxial (HFC) networks. As for the former element, the cable sector has been further consolidated through merger and acquisition. For example, in October 2007, KDG bought 1.2 million subscribers from Orion Group in eight States. These moves are increasingly helping positioned cable operator to compete with DT through network upgrades (http://www.reuters.com/article/pressRelease/idUS95352+02-Jan-2008+BW20080102). Regarding HFC network upgrading, the German Cable Association forecast that 90% of connectable households will be upgraded by 2008: see Deutscher Kabelverband (2006, page 4). Moreover, on a brownfield basis, the cost to upgrade HFC network is estimated to be about half the FTTH CAPEX per subscriber: see Luiten (2007).

\textsuperscript{33} The relationship between regulation and investment is a contentious one, which is beyond the scope of this paper. Taking a European and evidence-based focus, among the advocates that unbundling regulation has crowded out investments in alternative infrastructure: see, Distaso et al (2006); Waverman et all (2007); and Röller et all (2007). For a contrarian (and more institutional) view, see: London Economics e PricewaterhouseCoopers (2006); Cadman (2007); and OECD (2007a).

\textsuperscript{34} See Kahn (2006); and Cave (2007).

\textsuperscript{35} In particular, Kahn (2006) proposed a “bright line” test for the presence of rivalrous behaviour sufficient to justify regulatory forbearance, in that the facility-based carrier has taken over some specified percentage (say, 5%) of the subscriber access lines of the PSTN incumbent, in a market geographically designed by the reach of the facilities of the competitor.

\textsuperscript{36} In reference to the current broadband generation, this is arguably the main rationale underpinning Ofcom’s recent proposal to deregulate in those geographic areas covered by local exchanges serving at least 10,000 premises where there are at least 4 COs: see Ofcom (2007b). The European Commission has endorsed this approach (http://europa.eu/rapid/pressReleasesAction.do?reference=IP/08/232&format=HTML&aged=0&language=EN&guiLanguage=en). In reference to the transition to NGA, this approach is taken into consideration by the Spanish regulatory authority, CMT, thanks to the increasing competition in the
to unpopular geographically differentiated retail prices, in particular, given that prices have traditionally been held in telecommunications markets.\footnote{There emerges a conflict between supply and demand side pressures, where the latter advocate for uniform prices due to a common pricing constraint, which reminds to the rationale underpinning the imposition of universal service obligation (USO). In other words, retail prices may be kept uniform even if unregulated because of voluntary commitments (or, company inertia) by operators: see Richards (2007).}

Notwithstanding the merits in stretching the arguments in favour of regulatory forbearance also in 1-X areas – i.e. where only the PSTN incumbent is present – to promote inter-platform competition,\footnote{With this regard, Spain is a case in point. Once paired with Italy as the European laggard in terms of cable TV penetration, cable now reaches 55% of households, having decoupled from 1998, when the main cable operator, ONO, started its business: see Coderch (2007). For a radically different (indeed negative) view on the social merits of inter-platform competition from European cable operators see Höfler (2007).} Cave (2007) argues that there is considerable scope for intra-platform access regulation to be extended to NGA across Europe.

Remedy-wise, access regulation can be classified as promoting either facility-based competition through mandatory unbundling of the “physical” local loop, or service-based competition through the mandatory provision of bitstream services.\footnote{These regulatory provisions refer, respectively, to market 4 (once 11) and 5 (once 12) within the Regulatory Framework, as recently reviewed: see European Commission (2007c). In particular, with reference to the former, it is worth nothing that the European Commission has followed the ERG’s opinion to broaden the definition of LLU from “metallic” to “physical” in order to comprise also optical fibre infrastructures (ERG, 2007a, section 4.2.2, page 78).}

The transition to NGA might drastically reshape the relationship between these two remedy approaches. According to the “ladder of investment” paradigm,\footnote{See Cave (2006).} which has been fully endorsed\footnote{ERG (2006).} and implemented\footnote{ERG (2007c).} by European regulators, the provision of bitstream access was originally meant to be a temporary and intermediate remedy allowing COs to penetrate the DSL market without having to invest first in their own access network infrastructure, but with a view to climb up the ladder and incrementally move to facility-based competition once achieved a viable scale in terms of customer base.\footnote{For a critical view on the validity of this paradigm: see Hausman & Sidak (2005).} However, the likely decommissioning of current access points at the local-exchange level would require “un bundlers” to either climb further up the ladder, and hence interconnect further down at least at the sub-loop/street cabinet level; or climb the ladder down, and rely on bitstream access. In this respect, there is a \textit{prima-facie} consensus that bitstream access may become the final rung of

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the ladder: that is, service-based competition may emerge as the only workable competitive mode.\textsuperscript{44}

However, when it comes to envisage appropriate remedies, the current debate appears to be skewed in favour of structural remedies to assist facility-based competition – e.g. sub-loop unbundling and ancillary remedies such as collocation at the street cabinet and duct sharing.\textsuperscript{45} This is consistent with the informational framework described above: while there is (relative) certainty about the (supply-side) cost implications of NGA roll-out, which inform the debate about structural (unbundling) remedies; the (demand-side) uncertainty about end-users’ WTP drastically complicates any attempt to envisage proportionate behavioural remedies – i.e. setting wholesale tariffs to safeguard service-based competition, while not preventing efficient infrastructure investments.

From a decision-theoretical perspective, under the described context of symmetric imperfect information on future demand conditions, regulatory intervention might give rise to costly failures either in terms of false negatives (i.e. disincentivizing dynamically efficient investments), or false positives (i.e. incentivizing inefficient, too large and early investments). As regards type I errors, the ex-ante perspective in the NGA debate implies that the access price is not just a method for redistributing economic value among stakeholders – i.e. the PSTN incumbent, COs, and consumers - but it is also a signalling device, thus primarily affecting the stock of economic value to be distributed. Therefore, to give the correct signal (to provide investors with a “fair bet”), regulators should adjust access prices to reflect the risk of substantial investments into NGA that become sunk upon deployment.\textsuperscript{46}

However, given the degree of complexity in terms of information required to implement risk-adjusted techniques,\textsuperscript{47} regulators seem wary to adopt any of them\textsuperscript{48} (ERG, 2007a, page 24):

Where regulation prevents a bottleneck asset owner from leveraging market power into higher returns downstream, resulting in the bottleneck asset owner deciding not to deploy NGA, efficient investment incentives have not been distorted. In this case, the incentive to invest is based on the ability to leverage market power in the bottleneck asset into a downstream market. If the business case for this investment relied upon such leveraging of market power into downstream markets by the bottleneck asset owner, it would not be an efficient investment.

\textsuperscript{44} ERG (2007a, page 50); and Ofcom (2007a, par. 6.30). A remarkable exception is the French case, where the local NRA, Arcep, is adopting several legislative measures to facilitate COs’ NGA roll-out: see Gauthey (2007). However, the national competition authority (NCA), Conseil de la concurrence, has opened an investigation over allegations for abuse of dominant position in refusing to give its competitors access to its civil engineering infrastructures (http://www.conseil-concurrence.fr/user/standard.php?id_rub=256).

\textsuperscript{45} While the ERG paid only lip service to possible price control obligations, dedicating just one paragraph (ERG, 2007a, page 24) out of 66 pages to this issue; Ofcom has drastically cut its analysis of possible pricing mechanism (previously presented in Ofcom, 2006, par. 4.27-4.64) to focus on the so-called “anchor product regulation” (Ofcom, 2007a, par. 5.28-5.40 – see note 11).

\textsuperscript{46} Ofcom (2006, par. 4.48).

\textsuperscript{47} This argument is rooted in the application of real options theory in access regulation. With a focus on telecommunications: see Hausman (1999; 2003); and Pindyck (2007).

\textsuperscript{48} See Ofcom (2007a, par. 5.18 at page 37).

\textsuperscript{49} For example, risk-adjusted rate of return; differentiated WACC (activity-specific cost of capital); or the more exotic real option technique: see Ofcom (2006, par. 4.41-4.68).
Moreover, Ofcom (2007a, par. 5.18 at page 38) argues that under the Regulatory Framework, any such attempt might be frustrated by the impossibility for regulators to credibly commit to set future access terms to reflect the risk incurred at the point of the investment, as the finding of one market review cannot bind the finding of a subsequent one. That is, the time-inconsistency problem in enforcing long-term regulatory contracts having been institutionalized.

Nonetheless, being able to credibly commit to a specified rate-of-return may lead to type II errors, whereby regulators might incentivize inefficiently early or large investments, as the merits of NGA are difficult to predict in advance. This issue is reminding of the so-called Averch-Johnson effect, whereby rate-of-return regulation may lead to an over-capitalization bias. However, a difference exists in that Averch & Johnson (1968) argued that rate-of-return regulation might distort the incentives to cost minimization given the level of output (i.e. productive inefficiency with demand certainty); whereas the transition to NGA might turn out to be socially wasteful in light of the realized consumers’ unwillingness to pay (i.e. allocative inefficiency under demand uncertainty).

Nevertheless, consumers’ WTP may not entirely reflect the social value from the transition to NGA – i.e. in situations where public and private benefits combined exceeded the cost of provision, but not private benefits alone. Under such circumstances, a utility-style regulatory approach may be justified in order to internalise the positive (social) externalities from NGA deployment – e.g. due to teleworking; e-government; e-health; e-education services. However, the lack of supporting evidence is holding regulators back, as “intervention may carry a high direct cost and carries significant risk to the efficient operation of the market and competition in the future.”

50 For a detailed treatment of this issue: see Sidak & Spulber (1997); for an analysis of three case studies in reference to the ability to credibly commit to regulatory forbearance: see Eisenach & Singer (2007).
51 In this respect, Australia is a remarkable contrasting case. As described in note 4, the local NRA, ACCC, launched a consultation on an NGA proposal from a consortium of COs named FANOC. In particular, this proposal implied a 15-year regulatory contract based on a utility-style approach, whereby access terms are periodically set to cover realised/actual (historic but recently incurred) costs. This solution would be in stark contrast with the typical forward-looking long-run-incremental-cost (LRIC) approach so far extensively applied and advocated in telecommunications regulation. Indeed, ACCC was not dismissive of such a U-turn in its policy approach to access regulation (ACCC, 2007b, section 6.2.1, pp. 84-86). In Europe, the Italian NRA, Agcom, is considering a rather similar approach alongside access separation: see Mannoni (2007).
52 ERG (2007a, page 65); and Ofcom (2007a, par.5.18).
53 See Averch & Johnson (1962).
54 Ofcom (2007, par. 7.39). Indeed, ACCC seemed mainly concerned with the Averch-Johnson effect when dismissing its relevance, as in the transition to NGA efficient and prudently actual costs could be known (ACCC, 2007b, section 1.2.2, page 12) – i.e. thanks to the context of symmetric (complete) information about future costs conditions. If any, ACCC justified not adopting the traditional forward-looking approach “to the extent to which the FTTN assets are governed by legislative protection from competitive overbuild (a stated condition of FANOC’s proposal), the access price will no longer continue to act as a signal of the relevant ‘build/buy’ decision for potential entrants. (ibid, section 6.2.1, page 86)”
55 This appears to be the main rationale underpinning direct government intervention in NGA deployment in Japan and Korea: see Ovum (2007).
56 Ibid.
57 Ofcom (2007a, par. 7.46). However, in the same paragraph, Ofcom recognised that “the lack of direct evidence to support any decision to undertake direct intervention may be to some extent a
Concluding, the peculiar informational (strategic) context characterizing the transition to NGA gives rise to both potential market and regulatory failures that are frustrating the recourse to the orthodox regulatory toolkit to intervene in a proportionate and pragmatic way that could effectively balance out the incentives of fixed incumbents with the interests of other stakeholders. The proposal that follows represents an attempt to address this regulatory impasse.

4. Proposal

The following proposal is meant to be an incentive-compatible behavioural remedy aimed at avoiding the described regulatory failures in the form of type I and II errors, which are due to demand-side uncertainty. Stated normatively, access regulation should give investors in NGA a symmetric “fair bet”, where the price should be set to earn a reasonable return on the basis of the expected cash flows from the investment at the time of deployment.

A sophisticated approach to figure out what this reasonable return should be is the real options methodology, where the investor is rewarded for the managerial flexibility extinguished when the decision to invest is taken. McDonald & Siegel (1986) and Dixit & Pindyck (1994) argued that the value of this sacrifice can be captured in the so-called “wait-and-see” option, whose value is given by the difference between the expected net present value from investing now and investing later. Notwithstanding the theoretical appeal of this methodology, its applicability has been mainly limited to the realm of corporate finance as a capital budgeting technique, whereas its degree of sophistication and the ensuing level of information required have so far discouraged its use by regulators.  

A second subtler obstacle to the application of real options by regulators is that options are usually compound, in that the initial investment may create further (growth) options to expand or diversify in ways unforeseen at the time of deployment. More radically, Adner & Levinthal (2004b) argued that the assessment of real options becomes very difficult as uncertainty gets resolved in increasingly incremental steps that are a function of firm’s activity. In other words, Adner & Levinthal (2004a) explained that the neat assessment of real options requires the original analogy with financial options to carry over to an investment of a non-financial sort. That is, the value of the option (and the underlying asset) is exogenous to the investor’s activity; and the market signal of option value is readily observable and independent of the investor’s behaviour.

The underlying idea of this proposal is to recall the original analogy between real and financial options, where “wait-and-see” real options are seen as financial call options attributing the right to buy the underlying asset at a predetermined exercise price. Moreover, as explained later on, the restoration of the original financial framework introduces a “division of labour” between regulators and the market that reflects

circular problem the demand for next generation access networks may be limited until new applications and services are developed, yet such new applications and services may not be developed until next generation access networks are available to deliver them over.” In this respect, on 22 February, 2008, the UK government launched an independent review to investigate whether public intervention would be appropriate (http://www.gmn.gov.uk/Content/Detail.asp?ReleaseID=354760&NewsAreaID=2).

58 Ofcom (2006, par. 4.58). Indeed, Hausman (1999; 2003) and Pindyck (2007) made use of the theory of real options to argue the social costs from regulatory failures leading to underinvestment by utility incumbents.

59 Ofcom (2006, par. 4.59).
distinctive capabilities in an incentive-compatible way; whereby regulators set the wholesale access price and the market prices risk in NGA deployment through the functioning of a commodity option market.

Procedural-wise, the mechanism is articulated as follows:

- The investor – e.g. the PSTN incumbent - announces its NGA deployment with corresponding roll-out commitments – i.e. coverage; year target; and technical specifications;
- Once an (industry) agreement on the technical specifications has been reached, the regulator auctions off a number of call options to access the NGA infrastructure at the wholesale level via bitstream/active line access. More in detail:
  - The access terms (the exercise price) is set - and, possibly periodically revised - by the regulator;
  - Options allow universal active/bitstream access (the underlying asset) throughout the deployed NGA infrastructure – i.e. unrestrained across time and space;
  - Access is also unlimited, thus availing the option owner of the faculty to resell it;
  - The downstream division of the incumbent is not allowed to bid, to prevent it from opportunistically inflate (bidding up) the price. Nevertheless, it may eventually be required to contribute the winning price;
  - Bidding is unrestricted;
  - Options can be traded, but not split, in a secondary market;
- Auction revenues contribute up-front to NGA deployment;
- On option exercise, purchasers pay the regulated access price on a pay-as-you-go basis – e.g. monthly fee for bitstream access services;
- Nevertheless, wholesale access can always be negotiated on voluntary terms, except, obviously, on behalf of the downstream division of the incumbent.

Two elements of the proposal require further clarification. Firstly, regarding the methodology used to set regulated access terms, the \textit{ex-ante} perspective and the symmetrical informational setting characteristic of NGA investments suggests the use of actual (announced) expenditures to formulate them, thus eliminating the need to engage in cost modelling to estimate forward-looking LRIC of a hypothetical new network operator.\footnote{ACCC (2007b, page 86).} In this respect, this approach is reminding of the building-block approach traditionally used to regulate prices for long-term investments in utilities – e.g. gas, electricity and water infrastructures; whereby the regulatory asset base (RAB) is a forecast of operating and capital expenditures (CAPEX), which are set up-front given realistic expectations of demand, and where CAPEX are rewarded using normal rate of return.

However, there are two crucial distinctions from the traditional utility-style approach, specifically:
To bypass the issue of the presence of demand-side uncertainty, calculations are based on rosy expectations of demand, rather than realistic (i.e. which would arguably make the option “in the money”) – that is, akin to assume an optimistic demand growth scenario in a forward-looking methodology;

Access terms cannot be adjusted in subsequent periods to ensure cost recovery in case of demand shortfall.

Therefore, this proposal could be conveniently thought as a hybrid solution between the risk-sharing, utility-style approach - typically advocated by PSTN incumbents - and the forward-looking, non-interventionist pricing approach - usually preferred by telecommunications regulators.

Secondly, in line with the original analogy between real and financial options (whereby an investor is assumed to have no influence on the stock market and is a price taker for the underlying commodity), participation to the auction is not limited to industrial operators; hence it is open to financial and institutional investors. Their participation would be instrumental to the sound functioning of the mechanism for at least two reasons:

- The extension of the population of potential bidders - in particular, speculative ones - should contribute to the bidding competitive rivalry;
- Their participation in the secondary market should allow prices to be dynamically adjusted, in order to correct for arbitrage opportunities insofar as demand uncertainty is (incrementally) resolved.\textsuperscript{61}

In a nutshell, the main feature of this framework is to be responsive to stakeholders’ vested interests. As argued in the next section, this incentive-compatibility would result in regulatory soundness on several grounds.

### 4.1 Regulatory soundness

As explained in Section 3, the \textit{vacuum} in the European regulatory debate regarding the adoption of concrete and proportionate behavioural remedies to promote service-based, intra-platform competition on NGA infrastructure - provided that incentives to invest efficiently (and not just \textit{per se}) are preserved - is due to the \textit{ex-ante} perspective, which frames regulatory intervention within a symmetric imperfect strategic setting, whereby both the regulator and the prospectively regulated firm face demand uncertainty. Within this context, regulatory intervention to mandate bitstream/active line access might cause both type I and II errors. In other words, to avoid precluding (dynamically) efficient investments in NGA, regulators may bow towards investors’ request for greater regulatory certainty in the future and guaranteed returns on NGA investments. However, this might lead to a socially wasteful, interventionist regulatory stance, seeking investment, and not consumer benefit, as an outcome. Moreover, as regulatory intervention should be firstly aimed at addressing the anti-competitive concerns due to the emergence (or, strengthening) of an enduring economic bottleneck at the wholesale level, mandated access terms should place COs on equal footing against the downstream division of the incumbent.

\textsuperscript{61} In turn, this should incentivize industrial operators to participate in the auction, as the correct functioning of the secondary market would rule out \textit{ex-post} opportunism to gain favourable access terms in case the transition to NGA turned out to be commercially successful and, thus, financially viable.
With this regard, ERG (2007a, page 26) emphasized the need for greater transparency on investment plans, in order to allow a broader engagement of all the stakeholders in the transition to NGA. In this respect, as outlined in the previous Section, the proposal advanced in this note would require the investor to transparently and voluntarily activate the process before the regulator.\(^62\)

Moreover, it would be in the investor’s interest to provide exhaustive information on its plan and to reach an agreement on the technical specifications for the provision of wholesale access as extensively shared as possible, in order to solicit strong bids and thus maximise auction revenues. This would be particularly so given its ineligibility to participate to the auction.\(^63\)

Auction revenues would account for (reward) only the specific (systematic) risk\(^64\) in NGA at the time of deployment.\(^65\) Moreover, this risk would be shared (pooled) through the auction across a variety of stakeholder, thus resembling risk-sharing in case the investments in NGA was cooperatively undertaken.

Therefore, from the investor’s perspective, this approach would achieve both risk rewarding and reduction. Moreover, from a public perspective, this pooling property may provide a negotiating platform suited to promote an industry agreement to undertake a nation-wide deployment without recurring to public intervention (i.e. funding). Finally, in the remote scenario where the auction went vacant, this would amount to regulatory forbearance for the investor (e.g. the PSTN incumbent).

As for the (recurring) access terms, the regulator would set the wholesale price by applying its traditional toolkit, without having to meddle with unorthodox and info-demanding risk-adjustment methodologies. The regulator task would be further simplified for two reasons: i) the reliance on actual (announced) costs would spare the adoption of a forward-looking cost model to estimate access LRIC for a hypothetical, efficient new entrant; and ii) the adoption of “optimistic” demand assumptions would make it unnecessary to model and treat a range of alternative demand growth scenarios.

Nonetheless, the regulator would still need to design the auction and define its procedural rules, thus maintaining a degree of control throughout the process. In particular, it would be necessary to specify the number of options to be auctioned. On

\(^62\) Although the debate around functional separation is beyond the scope of this note, it is worth noting that this approach would be administrable regardless of the presence of functional/structural separation. Nevertheless, the described openness at the beginning of the procedure would be supportive of the introduction of vertical separation on a voluntary basis (ERG, 2007b); rather than being unilaterally imposed by the regulator, as recently implied in the European Commission’s proposal to reform the Regulatory Framework (European Commission, 2007b).

\(^63\) Although the discussion of the specific auction format is beyond the scope of this paper, the incidence of demand uncertainty – which could be thought of in terms of common value problem; the ban on the incumbent to bid – which would prevent strategic bidding aimed to either inflate auction revenues or deter participation; and the heterogeneity across potential bidders – which should make collusive bidding harder to reach and sustain – are in favour of the use of an open, ascending format. For a detailed analysis of possible anti-competitive concerns in auction and bidding markets: see Klemperer (2005).

\(^64\) In similar terms, but referred to the risk-adjusted rate-of-return methodology, the Italian NRA, Agcom, has proposed a “broadband premium” to be applied to the traditional WACC: see Agcom (2007b, point 10 at page 44).

\(^65\) In this respect, it is worth reminding that the value of a call option is positively linked to the volatility (uncertainty) of expected returns on the underlying asset (in the case at hand, ultimately dependent on consumers’ WTP for next-generation services).
the one hand, finiteness would be necessary to create supply scarcity, in order to raise demand at the auction stage.\textsuperscript{66} On the other hand, this restraint may appear as artificially and unduly restrictive of downstream competition.

However, in the face of it, this criticism would not stand close scrutiny. According to Ofcom (2007c, fig. 5.18 at page 171), despite regulatory initiatives to increase competition and the development of both wholesale markets and LLU across Europe, the retail market share of the top three broadband providers increased or remained the same between the end of 2004 and the end of 2006 in nine major European countries, with an average C3 ratio above two-thirds. Moreover, predictions are made that the transition towards NGA will further this consolidating trend.\textsuperscript{67}

Notwithstanding this consolidating trend, the OECD (2007b, page 220) reports that retail prices have generally decreased, while performance rates have improved.\textsuperscript{68} This seems at odds with the general impression that increasing market concentration may generate increases in price.\textsuperscript{69} However, Sutton (2007) described how it has long been established that an opposite relationship can hold as well, whereby higher concentration may be (endogenously) explained by the “toughness of price competition.”\textsuperscript{70} In this respect, uncertainty about consumers’ WTP; product homogeneity; the relevance of subscribers acquisition and retention cost (SARC);\textsuperscript{71} and the absence of capacity restraints (due to universal coverage attributed to option owners)\textsuperscript{72} all suggest that intense price competition will be the prevailing competitive mode also for next-generation broadband services.\textsuperscript{73}

Finally, access seekers would still be able to negotiate wholesale access on voluntary terms with either the incumbent or winning bidders (or subsequent options’ buyers in

\textsuperscript{66} Although in the auction literature the number of items on sale is generally assumed as a given - whereas the number of bidders can vary endogenously - the practical importance of reaching the proper balance between supply and demand has been exemplified in a few fiascos among the European third-generation mobile licence auctions: see Klemperer (2002).

\textsuperscript{67} See Dann (2007); and Wittig (2007). In this respect, France - where COs have actively invested in NGA - is a case in point, where the biggest increase has occurred, with the retail share of the top three providers (Orange, Neuf Cegetel and Iliad) increased from 66\% at the end of 2004 to 82\% at the end of 2006, and has since risen to 85\% as at the end of June 2007: see Ofcom (2007c, page 170).

\textsuperscript{68} Among the pack, Ofcom (2007c, page 43) reckons that France stands out as the price leader.

\textsuperscript{69} For the enduring importance of concentration measures in merger regulation, see Baker (2008).

\textsuperscript{70} Indeed, the traditional use of the Herfindahl-Hirschman-Index (HHI) as a proxy for price elevation is posited on static non-cooperative oligopoly models of quantity (Cournot) competition. See Martin (2002, ch. 6).

\textsuperscript{71} According to the framework proposed by Sutton (1991), marketing expenses to acquire telecommunications consumers can be classified as endogenous sunk costs.

\textsuperscript{72} It is generally regarded that the presence of capacity constraints due to network pre-commitment make the distinction between Cournot and Bertrand model of oligopolistic competition less fundamental in communications markets. Theoretically, this reflects the importance that has been broadly recognized to Kreps and Scheinkman (1982)’insights that Bertrand competition under capacity constraints leads to Cournot-like outcomes. However, the dramatic price drops for dark fibre experienced in the backbone market during the early ’00 show how these predictions no longer hold when firms believe they are not capacity constrained (Shelanski, 2007, page 91).

\textsuperscript{73} Otherwise, were (tacit) collusive outcomes in the form of excessive retail prices to emerge, \textit{ex-post} intervention through competition law enforcement would be the most appropriate form of regulation. In this respect, it is well accepted in the merger literature that while unilateral effects arise primarily posited on differentiated Bertrand or capacity-restrained Cournot oligopoly, tacit collusion can be reached also under homogeneous Bertrand competition (Ivaldi et al, 2003).
the secondary market). Alternatively, they may directly purchase the option in the secondary market.\footnote{74}

All in all, this approach would be respectful of the Regulatory Framework, as regulators would not be required to enter into contingent commitments over a long period of time. Although this proposal resembles the building-block approach, as it is based on actual costs information, it differs from utility-style regulation in that it does not make use of the RAB mechanism, which would command subsequent upward price adjustments in case of (unexpected) revenue shortfall. In other words, the regulator would not be asked to ratify the incumbent’s investment plan (i.e. thus running the risk of promoting investment \textit{per se}), as if demand did not materialize, cost recovery would not be granted. This framework would hence achieve regulatory certainty without unduly easing the investor of its entrepreneurial risk.

Moreover, this proposal would comply with the principle of equality of input (EoI), as the investor/incumbent would be required to supply wholesale (active line) access to option owners at non-discriminatory regulated terms. More radically, as the option would attribute universal and unlimited access to each and every option owner, the auction would convert the (technical) natural monopoly into a (contractual) oligopolistic structure at the wholesale level – e.g. similar to the market structure in the mobile industry.

Regulatory-wise, this contractual fragmentation would address anti-competitive concerns of individual SMP due the creation (or strengthening) of an enduring economic bottleneck at the wholesale level, as each and every option owner would have the faculty to supply (resell) active line access by virtue of its unrestrained reach. From the investor perspective, this would add to regulatory certainty, as opportunistic access seekers would be prevented from alleging to have been anti-competitively foreclosed in the form of refusal to supply wholesale access on reasonable terms by a monopolistic incumbent, thus triggering regulatory intervention in their favour. Under the Regulatory Framework, this approach would be conducive to the deregulation of wholesale broadband access – Market 5 (once 12);\footnote{75} whereas regulatory oversight may rely on \textit{ex-post}, rather than \textit{ex-ante}, intervention through the enforcement of general competition law.\footnote{76}

Regulatory certainty would be granted also thanks to the options’ attribute of universal geographic coverage. As option’s ownership would bypass the need for COs to achieve scale economies, by focussing their activities on densely populated areas, this would bypass the need to define geographically differentiated markets as well, and would thus preserve the (voluntarily-reached) common pricing constraint at the retail level on a national basis.

Finally, this radical shift in the competitive mode - whereby the auction would convert the competitive mode from fixed to mobile - may be conducive to widespread

\footnote{74 Once again, \textit{ex-post} regulation through competition law enforcement would be the best instrument to eventually tackle alleged exclusionary abuses of collective dominance in the form of refusal to supply wholesale access.}

\footnote{75 Arguably, this is the ultimate goal of the Regulatory Framework, as witnessed by the recent delisting of a number of predefined markets – i.e. in particular, Market 15 for the provision of wholesale access and call origination on mobile networks: see European Commission (2007c).}

\footnote{76 Hence, similarly to the mobile industry, refusal to supply wholesale access may principally be alleged in the form of collective, rather than individual, dominance abuse, thus implying a higher burden of proof to reach conviction.}
service innovation, as universal geographic coverage would allow and incentivise COs to uniquely pursue consumer satisfaction, rather than local densities – i.e. no (opportunistic) cream skimming strategies.

5 Conclusion

During a speech given at a conference hosted by the Dutch PSTN incumbent, KPN, in January 2008, the European Commissioner Viviane Reading stated that:

How we treat next generation access is therefore the single most important policy question in the telecoms sector today. We have to create incentives for investment whilst making sure that no-one (and I insist on this no-one), can be in a position to foreclose the market. What are the incentives to invest? The key is a stable and predictable regulatory environment. Investment decisions are finely balanced. If we are to encourage market players to invest in upgrades to the access networks, they will need to be able to offer a long term return on investment to their investors (emphasis added).

This passage is a compelling manifestation of the regulatory impasse described in Section 3. While European regulators recognize operators’ uneasiness to invest in NGA, their reliance on the paradigm applied in the last decade fails to unleash investors’ “animal spirits”. The proposal presented in this note is an attempt to address this regulatory deadlock. The reconsideration of the original analogy between financial and real options suggests mimicking the functioning of a commodity option market as a solution to separate the task of regulating the (recurring) access terms from the issue of correctly pricing (rewarding) the entrepreneurial risk in the deployment of NGA investments. In so doing, regulators would remove the regulatory risk of undue appropriation, due to their unwillingness to enter into long term “contract” with investors.

At the same time, COs are called to be part of the transition to NGA in a transparent way, thus being allowed to compete with the incumbent on equal footing, while precluding opportunistic ex-post free-riding in case the transition was fulfilled successfully.

Although the exposition in this note is focussed on NGA, this framework could be a valid proposition across other utilities, in particular, when a new challenge is posed by the presence of unconventional demand uncertainty in the face of substantial infrastructure investments.

References


77 Reading (2008, page 3).
78 According to Keynes (1936), the formation of entrepreneurial expectations on investment in an uncertain environment depends on conventional judgements and animal spirits, in addition to and supporting rational calculation. See Farmer (2008).


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