Reconsidering *ex ante* Regulation in the Dutch Electronic Communications Market

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Abstract: In this study we address the economic performance of *ex ante* regulation of the telecommunications industry and compare this regulatory framework to alternative approaches that respond better to the developments in the sector. The focus is on the Dutch market with two fixed networks with national coverage and a potentially converging mobile market. The economic effects of the *ex ante* regulatory approach are mixed. On the one hand it promoted lower retail prices for the benefit of consumers. On the other hand, the notion of a 'ladder of investment' – the transition from service-based competition to infrastructure competition – did not fully materialize. A central conclusion is that regulation needs to focus less on static efficiency, that is, competition, in favor of dynamic efficiency, namely investments and innovations. This shift in emphasis would be more in line with social welfare as the ultimate objective of regulation. It would require regulation to create more room for market forces (deregulation) and therefore to diverse and new business models. Deregulation, however may need to be complemented with *ex post* supervision and a reconsidered form of access regulation as a backstop option.

Key words: *ex ante* regulation, deregulation, negotiation, co-investment, asymmetric vs. symmetric approach.

What are the economic effects of regulation on the telecommunications industry? Compared to the situation shortly after market liberalization in the late 1990s, the picture looks more complicated. It is no longer an issue of getting entrants into the market, helping them to overcome the large asymmetries with incumbent operators.

A central question these days concerns the interaction between regulation and market incentives to upgrade networks to NGAs, in a world in which consolidation has been a constant force for many years now.

This paper reviews the impact of regulation on investment incentives, by surveying the academic literature in this field, and studies possible alternatives to the current approach. The relevance of these issues is illustrated by the Dutch market for fixed telecommunications. The Dutch example is interesting because of two reasons. The first reason is the recent merger between cable operators UPC (Liberty Global) and Ziggo, creating a cable operator with national coverage. Thus there will be competition between two national networks, namely the copper network of KPN and the cable network company of Ziggo. In addition, there will be competitive pressure from access seekers. The second reason is regulator ACM's recent proposal for access obligations on KPN only, including the fiber network – which has a smaller market share than the combined cable company. This decision raises questions about whether ACM is in fact supporting a healthy climate for investments in networks. It may well be that access regulation as currently designed is distorting the dynamics of competition in the market.

More precisely, we will address the following questions: What are the economic effects of the current regulatory framework, which relies on an *ex ante* approach to regulation? What are the current developments in the telecom industry, in particular in the Netherlands? What are the alternatives for *ex ante* regulation that reflect these developments better than the *ex ante* approach?

In answering the first question, we rely on the extensive theoretical and empirical literature that evaluates the current regulatory regime. Based on evidence on the future developments, we reformulate the current goal of telecom policy. The last question on the fit of alternative models is answered by applying theoretical findings, as empirical evidence on these models is not available yet. The Dutch example illustrates the relevance of our analysis and the need for a new regulatory model. Detailed recommendations on the optimal model, in particular for the Netherlands, are however unfeasible due to the lack of empirical evidence. It is also beyond the scope of this paper to comment in detail about the UPC/Ziggo merger, the acquisition of Reggefiber by KPN, and ACM's recent proposal to mandate access to KPN's network only.

The structure of this paper is as follows. The following Section contains a description of the market and current regulation. To look ahead towards

alternative regulatory models, insights from economic analyses are presented in the 3rd Section. In the 4th Section, we will discuss alternative regulatory models in the light of their effects on competition and investments. Then we conclude with a recapitulation of our key findings.

■ Broadband market in the Netherlands

The Dutch market

Broadband access markets in the Netherland can be characterized by intra-platform competition based on LLU and other forms of service-based competition on the one hand, and inter-platform competition between infrastructures on the other hand (see Figure 1). Uniquely in the EU, in the Dutch market two fixed infrastructures – DSL (KPN) and cable (Ziggo, after the merger of UPC and Ziggo in 2014) – each have almost full national coverage. Penetration in the fixed infrastructure is 90.3 percent of all households (or 40.7 per 100 inhabitants; see Table 1) and it is increasing. 42.5 percent of subscriptions are contracted on the DSL network (38.4 percent of households) and 47.6 percent on the cable network (43.0 percent of households). At the end of 2014, 2.3 million households (30 percent of households) had a connection to a fiber optics network [1] and 10 percent of subscriptions (8.9 percent of households) had broadband access on fiber networks. The merger between cable operators UPC and Ziggo was a major event in the Netherlands in 2014, creating one cable network with (almost) national coverage. In anticipation of a decision by the Dutch regulator ACM, [2] the Dutch government expressed the view that, while a situation with two networks with national coverage and that share the market evenly does not deliver sufficient competition, regulating access to cable networks is not possible under current EU regulations. [3] Similarly, the European Commission chose not to require UPC and Ziggo to provide access to their networks.

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1 http://bit.ly/1Kc58su

2 "ACM maintains KPN wholesale broadband regulation", Telecompaper, October 31, 2014. "KPN moet concurrenten ook komende drie jaar toegang verlenen", ACM press release, October 31, 2014.

3 "Govt says open access cable not possible under EU rules", Telecompaper, September 22, 2014.

Figure 1 - Competition at wholesale and retail levels in the broadband market

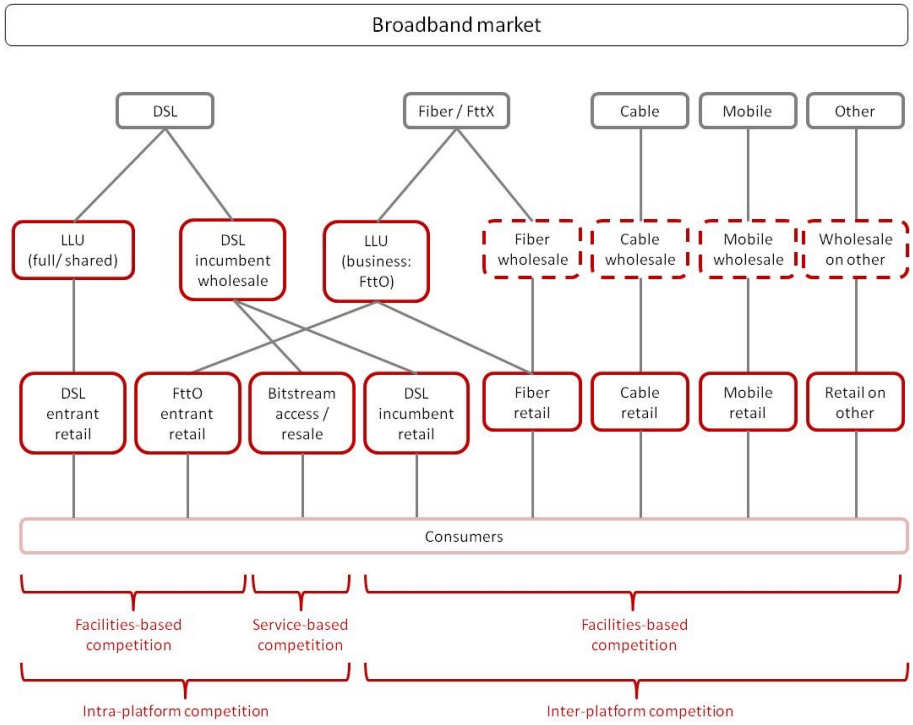


Table 1 - Cable penetration exceeds DSL penetration and increases (in 2014 Q4)

	Number of retail broadband subscriptions	*Percentage of total number of households*
DSL	2,912	38.4
Cable	3,260	43.0
Fiber	679	8.9
Total	6,851	90.3

Source: ACM: number of subscription ; CBS: number of households: 7,590 thousand; number of inhabitants: 16,887 thousand

Current regulation

The Dutch market is primarily regulated by the Dutch Telecommunications Law 1998 and the European regulatory framework. [4]

[4] https://ec.europa.eu/digital-agenda/en/telecoms-rules

Back in the beginning of the millennium, the Telecommunications Law aimed at the liberalization and harmonization of the telecommunication sector. Since then, it has been a framework. The latest substantial change has been the network neutrality regulation, which dates back to 2012 and is effective as of 1 January 2013.

The goal of the EU framework – among others – is the harmonization in the sector at a European level and creating competition during the transitional phase from national monopolies to competitive internal markets (BALDWIN, 2013). By increased competition, consumers obtain increased choice at lower prices, with better quality and more innovative services. In particular, the Framework and Access directives aim at addressing significant market power (SMP) in the relevant wholesale markets and impose forward-looking cost-oriented access regulation. Assessments of SMP are based on a simplified "three criteria" test. [5]

Important for this study, the wholesale (physical) network infrastructure access (shared and full local loop unbundling (LLU)) and wholesale broadband access (i.e., non-physical or virtual access, such as bitstream) at fixed location are listed among relevant markets. [6] Only the fixed DSL infrastructures and (partly) fiber optics have access obligation. Cable networks have no access obligation.

Access regulation was shaped in a way that entrants on the fixed infrastructure can start building up their own networks. Investments were meant to take place at stepwise levels of access: first by firms at the resale level, then at the bitstream access level, and finally by local loop unbundlers. This principle reflects the underlying notion of the 'ladder of investment' (LOI; CAVE & PEITZ, 2013).

Effects of current regulation on market performance

The economic effects of the *ex ante* regulatory approach are mixed, both for the Netherlands and the rest of the EU. The current regulation has had a positive effect on static efficiency (i.e., short-term welfare). It promoted lower retail prices, which benefits consumers (TNO, 2014 and CALZADA & MARTÍNEZ-SANTOS, 2014). The effects of *ex ante* regulation on dynamic

5 https://ec.europa.eu/digital-agenda/en/node/67489/#red%20tape

6 Commission Recommendation 2007/879/EC.

efficiency (i.e., long-term welfare) are however ambiguous. Despite the continuously increasing broadband penetration, investments have not been sufficient. Empirical evidence shows that there is a trade-off between stimulating service-based competition and investment incentives (CAMBINI & JIANG, 2009; GRAJEK & RÖLLER, 2012; BRIGLAUER *et al.*, 2013). The main reason is that competition reduces market power, and thus the ability of firms to charge sufficiently high retail prices that are necessary for investments. Furthermore, the notion of a 'ladder of investment' – the transition from service based competition to infrastructure competition – did not fully materialize (CAMBINI & JIANG, 2009; BACACHE *et al.* 2014; BOUKAERT *et al.*, 2010; NARDOTTO *et al.*, 2014).

■ Insights about market developments based on economic analysis

Currently, electronic communications markets are characterized by several developments that influence firms' strategies for competing and investing and regulators' ability to respond to these strategies. These characteristics relate to market developments and uncertainty. Reconsidering the future goal of government policy in the electronic communications market may thus be required.

Market developments and uncertainties

The electronic communication market develops in a non-linear way. Values for consumers are not only created by internet service providers but also by the innovative nature of the OTT market (NOOREN *et al.*, 2014). These developments in return require investments in networks. Furthermore, new business models appear in the market, e.g., cloud computing or transit and peering. When internet service providers invest in networks, they need to anticipate these developments and related uncertainties in the market.

Furthermore, telecom providers experience three types of uncertainty (BIGLAUER *et al.*, 2013). Market uncertainty arises due to the above-mentioned innovative nature of the sector. Because of these developments, internet service providers experience an above average demand uncertainty. Therefore, they explore the attractiveness of the market and the best positioning on the basis of trial-and-error. Regulatory uncertainty relates to

the implementation and the impact of the regulatory framework, and, for instance in the Netherlands, to legal challenges (in court) of decisions made by the ACM. As CAVE & PEITZ (2013) argue, regulatory stability is a "precondition" for capital-intensive investments. Finally, policy uncertainty results from public interests regarding privacy and security, and the resulting attention of policy makers and politicians for the sector.

Moreover, an important feature of telecom industries is economies of scale. For wireless telecommunications, NAM *et al.* (2009) show for Korean mobile network operators that the long-run average cost (LRAC) curve is downward sloping, revealing the presence of economies of scale in production. FOREMAN & BEAUVAIS (1999) reach a similar conclusion using US data (also for wireless telephony). GLASS & STEFANOVA (2012) report that, to their knowledge, no prior study has empirically measured scale economies for (wireline) broadband services. Using 2010 data from rural US, these authors find significant economies of scale with respect to market size as measured by number of broadband lines. Lastly, the European Commission's decision on the UPC/Ziggo merger notes that 'the variable costs involved with operating cable/DSL/FttH networks are in any case considered to be comparatively low' [7]. Activating one additional household generates (almost) no extra costs since both networks are already connected to every household. Thus, the providers KPN, UPC and Ziggo have almost unlimited capacity to connect more households to their networks, as most costs are fixed and sunk (European Commission, 2014). The above points at economies of scale. On the other hand, the notifying parties did not argue that the merger leads to efficiencies.

Market responses

Scale effects drive fixed and mobile markets towards further consolidation. This natural tendency of the market - driven by characteristics of the telecommunications market - is at odds with the efforts of policymakers to stimulate competition between multiple networks. The clearance of the UPC/Ziggo merger and the acquisition of Reggefiber by KPN will challenge the logic of the current regulatory framework even more. Another trend that is observed in the market is that fixed and mobile become closer complements as well as substitutes.

[7] European Commission, M.7000 - Liberty Global / Ziggo, 10/10/2014, para 498.

Table 2 - Market shares (%) of the largest firms in fixed and mobile internet markets, Q4 2013

Service providers	*Fixed internet*	*Mobile telephony and internet (*)*
KPN	40.4	50.1
Ziggo	27.3	-
UPC	15.7	-
Vodafone	-	27.1
T-Mobile	-	22.8
Other	16.6	0.0

(*) Contains market shares of MVNOs. LTE networks are excluded.

Source:TNO (2014)

For the sake of illustration, the following figure contains a back-of-the-envelope calculation showing how market shares of firms could change if further consolidation and convergence takes place. Although UPC and Ziggo's networks did not overlap geographically prior to the merger, market shares are computed on a nationwide basis for the sake of the argument. Taking the current situation as a starting point, as a thought experiment, two situations are considered:

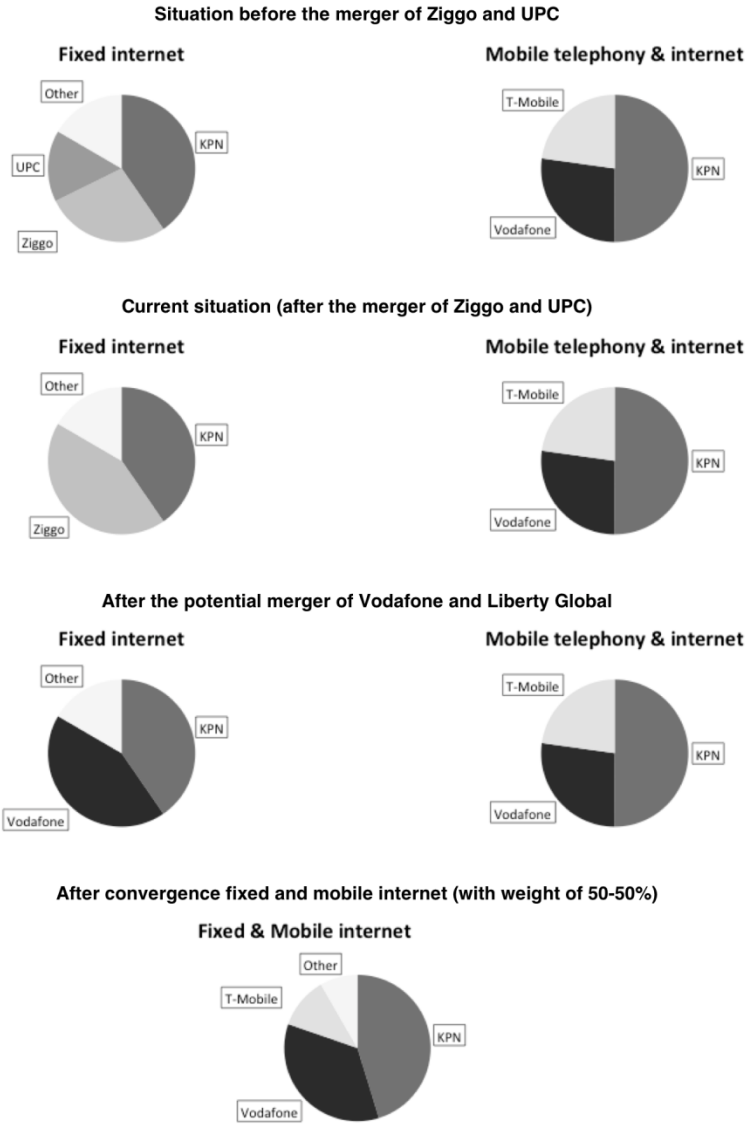
- a potential merger of Vodafone and Liberty Global (UPC); [8] and
- the future convergence between fixed and mobile. The two networks are weighted evenly (50-50 percent) in calculating future market shares.

A few notes need to be made here. In the exercise it is assumed that there are no other market dynamics, for instance based on the strategic responses of firms. In other words, market shares of firms not involved in the consolidation remain the same. Furthermore, other exogenous developments are also not taken into account in the future market shares.

As Figure 2 shows, both the fixed and mobile internet markets might be dominated by two players. After a potential merger (or takeover) of Vodafone and Liberty Global, KPN and Vodafone would dominate these markets. As these companies have a comparable market share in each market, the convergence between fixed and mobile would leave them as two competing firms. In this case, instead of having four distinct infrastructures – fiber, coax/HFC, copper, and mobile – with competing firms, the converged market would be dominated by two firms.

8 Based on: http://www.telecompaper.com/news/vodafone-could-bid-for-liberty-global-after-next-year-ceo--1036707 and http://www.bloomberg.com/news/2014-09-17/vodafone-liberty-global-deal-is-way-to-end-duel-real-m-a.html.

Figure 2 - Simple exercise based on further consolidation and convergence in the Dutch market



Data on Q4 2013. Although UPC and Ziggo did arguably not compete pre-merger, nationwide market shares are computed for simplicity.

Source: Own calculation of authors based on TNO (2014)

The process that would lead to such an outcome, would pose regulatory questions. First, should a further consolidation (the hypothetical merger between Vodafone and Liberty Global in figure 2) be cleared? This involves analyzing whether competition is reduced due to the merger. Second, are there scale economies involved that lead to efficiencies that offset the anticompetitive effects? The central question is whether two networks are enough. [9] From a consumer's perspective, two networks could be sufficient if the provided services are substitutable, which is currently the case (SKOUBY *et al.*, 2014, indicates that two networks each have sufficient capacity to serve the demand) and switching costs are low. Third, would a duopoly lead to an increased risk of tacit collusion? [10]

Regulatory responses

There is a distinction between static competition (with a focus on low prices for end users) and dynamic competition (with a focus on innovation and investment). The current regulatory framework aimed at both static and dynamic efficiency through applying the "ladder of investment", that is, service based competition which would induce investments in a stepwise fashion. [11] It has turned out hard to get the balance between the short term and long run right though, and the followed approach has been a mixed success at best. [12] Arguably, some regulators put too much weight on achieving low retail prices in the short term through stringent access obligations for incumbents, possibly discouraging entrants to roll out their own networks. As BENNET *et al.* (2002) argue, it is unlikely that first increasing static efficiency will result in an increase in dynamic efficiency – although in reality, the mechanisms tend to be much more complex than this.

At a general level, this approach calls for the stimulation of network investments and the adoption of high-speed network access and new services and content. However, the capriciousness and unpredictability of market developments require room for the dynamics present in the market,

9 See for instance Ecorys (2013).

10 The analysis of tacit collusion is outside the scope of this paper.

11 Static efficiency refers to the aggregate surplus in the short term, when technology is assumed to be given. Dynamic efficiency allows for changes in technology (through innovations and investments), and refers to the longer term.

12 See BOURREAU *et al.* (2010); FEASEY (2013), and references elsewhere in this paper.

so that market players can discover for themselves what they need (demand side) and how they can optimally anticipate this, or respond to market demand (supply side).

Based on these and the previous arguments, the following adjustments of the ambition and direction of policy goals require consideration:

1. More room for market forces, and therefore to diverse and new business models.

2. Room for the further development of complementarity (e.g., wired and wireless) and convergence (e.g., fixed and mobile and voice and data) between different types of services and networks. As CAVE & PEITZ (2013) argue, convergence between fixed and mobile, thanks to better mobile spectrum availability, reduces the boundary between technologies and implies stronger substitution between services on the networks (quadruple-play). This convergence is more viable in the rollout of LTE networks.

3. Room for developments from adjacent IT sectors (e.g., cloud services), adjacent service sectors (content, OTT), and new services with social value and potentially large impact (smart grids, health care; CAVE & PEITZ, 2013).

4. Attention to regional differences (geography, population density, type of development and economic activity; NARDOTTO *et al.*, 2014).

5. Attention to the cost difference between the legacy and next generation network of providing access, in particular the cost of copper and fiber (CAVE & PEITZ, 2013; NEUMANN & VOGELSANG, 2013).

6. More attention to the growing public interest concerning privacy and security, which might potentially be conflicting with the goal of competition (CAVE & PEITZ, 2013).

7. Simple and clear conditions with less intervention at a detailed level (such as delicate questions about SMP based on characteristics that are to some extent arbitrary; CERRE, 2014).

8. An active role of the government in areas where investments in local access networks lag behind (KRÄMER & SCHNURR, 2014).

Most of these requirements are considered below about alternative access. However some aspects, for instance 2 and 6, fall outside the scope of this study.

■ Alternative regulatory models

Late 2013, based on its mid-term vision about telecommunications, media, and internet, the Dutch Ministry of Economic Affairs started a discussion with stakeholders and independent experts about the reconsideration of the current regulatory model. [13] A relevant question in the on-going discussion is whether current access regulation can sufficiently follow the future developments in technology and of the market, and can help firms in reducing risks that are necessary for future investments. As the presented literature suggests, access regulation in its current form is not the most effective model to respond to the changes in the market. Therefore, in this section we consider several alternatives of deregulation, based on the economic and policy literature. [14]

Deregulation provides - if well designed - good investment incentives (NITSCHE & WIETHAUS, 2011; KOCSIS, 2014). However, as the electronic communications market is characterized by concentration, the regulator needs to consider the possibility of anticompetitive behavior (e.g. abuse of market power, margin squeeze or the potential for collusion; CAVE & PEITZ, 2013; BIGLAUER & GUGLER, 2013). One way to respond to anticompetitive behavior is *ex post* supervision. *Ex post* supervision remains required as a complementary measure to any deregulation model. Furthermore, supervision remains necessary to control mergers, which is relevant in a consolidating market to guarantee static efficiency. If merger control is performed in a way that efficiency arguments (e.g., economies of scale and investment and innovation incentives) are taken into account, it also favors dynamic efficiency. However, if it leads to the abuse of market power, a merger should be forbidden.

The other way to respond to (the potential of) anticompetitive behavior is to use access regulation as a backstop measure if the deregulation model fails to be effective. Finally, there might be other regulatory measures necessary, such as non-discrimination or transparency. Due to space constraints, we do not focus on these measures (for such models see CAVE & PEITZ, 2013; BIGLAUER & GUGLER, 2013).

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[13] Letter of 23 December 2014 from the Minister of Economic Affairs (*Kamerbrief over voortgangsrapportage uitwerking visie op telecommunicatie, media en internet*. http://bit.ly/17dOQiP).

[14] As alternative regulatory models are rarely applied in practice, most of the presented results are based on theoretical findings using simplifying assumptions. Therefore, the effects presented in the text and table are not necessarily applicable to the Dutch market.

A countervailing effect in terms of anticompetitive behavior is the lower incentives for non-price discrimination or sabotage, which may eventually occur in the presence of access regulation. If a vertically integrated firm is regulated, its most effective strategy to avoid downstream competition is to apply non-price discrimination. By arbitrarily reducing the quality of wholesale services, the network operator can increase its rivals' costs and eventually exclude them from the market (MANDY & SAPPINGTON, 2007). SAND (2004) shows that releasing access regulation and allowing higher access charges can lower the incentives for sabotage. In this section, we consider the four models of deregulation. Table 3 summarizes the effects.

Free wholesale price setting

An example of free wholesale price setting is the UK, the first country that introduced deregulation already in 2008. In the UK, local deregulation applies in regions where there is sufficient infrastructure-based competition. Ofcom's criteria for deregulation are twofold: BT gets deregulated if four or more principal operators [15] are competing or there are three principal operators with one potential entrant, and BT has a market share smaller than 50 percent. [16] BT remains regulated if there are only three or less principal operators in the market.

For the period 2008 and 2010, FABRITZ & FALCK (2013) exploited regional differences in local deregulation in the UK by empirical research. They show that on the medium term local deregulation has positive effects on infrastructure investments by both the incumbent and its competitors (incl. cable companies). Also, in these areas, competition became more intensive. Theoretical papers find similar results, however, this model is not seen as optimal in terms of investment incentives (NITSCHE & WIETHAUS, 2011; KOCSIS, 2014). This model seems relevant for the Dutch market when, in addition to the two network operators, there will be sufficient competition by Local Loop Unbundlers. Currently, the competitors of KPN and Ziggo amount to no greater than 15 percent market share. However, in the case of further convergence of technologies, the Dutch market may satisfy the UK-criteria for deregulation.

15 Principal operators are BT and Virgin Media, and six Local Loop Unbundlers with a national coverage of more than 45 percent of the UK premises.

16 Originally, an additional rule also applied, namely that there should be more than 10 thousand premises in the area. Ofcom found this rule redundant and canceled it as of 2010.

Voluntary open access model

The voluntary open access model is a form of self-regulation. The model proposed by KPN is an example of this. In its proposal, KPN (2014) offers voluntarily to open its network for access and commit to this offer for five year in its target network and three years on legacy network. In its position paper KPN sets the terms for this offer. As other models of deregulation, self-regulation may increase investment incentives compared to access regulation, although there are limitations to what self-regulation can achieve (due to the fact that firms' incentives may not be compatible with the maximization of total surplus). As finding the optimal conditions for self-regulation may not be possible, the government can conduct an analysis on the effects of self-regulation, for instance in the form of a cost-benefit analysis. Effects would then include the costs and benefits of self-regulation in comparison to government intervention, for instance access regulation (see e.g. BAARSMA *et al.*, 2004). Such an analysis could make an inventory of and measure as much as possible the size of market failures that self-regulation aims to solve and the potential regulatory failures that it may create.

Finally, even if self-regulation is designed carefully, it may not lead to an efficient market outcome (e.g. due to a commitment problem or regulatory failures). For such a case, self-regulation may require a regulatory threat of intervention.

Negotiated access

Negotiation models in the electronic communications market are suitable if negotiating firms in the vertical chain are willing to share the risks of investments by side payments and are able to negotiate a reasonable price. The price determined in the negotiation depends on the level of concentration of network operators (sellers) and downstream entrants (buyers). A seller (or buyer) can exert market power if it faces a large number of buyers (or sellers) or only a few strong buyers (or sellers). If only sellers (or buyers) have market power, negotiation leads to a monopoly (or monopsony) price and is not a plausible model of deregulation. If both sellers and buyers have a certain level of market power – as the literature calls it, bargaining or countervailing power – negotiation can be effective and

lead to an efficient outcome (TIEBEN & KOCSIS, 2012). [17] In this case negotiation can be a reasonable model of deregulation. As the current situation and the development of the Dutch electronic communications markets indicate, both layers in the vertical chain are concentrated. Currently, there are two competing network operators. As we argued earlier, the services of these operators are substitutes of each other, but not perfect substitutes, which reduces the possibility of tacit collusion. This indicates the presence of bargaining power, but not to an excessive extent. Moreover, in the near future, mobile network operators might also compete at the upstream level as fixed and mobile technologies converge.

At the downstream market there are only a few competitors with a total market share of approximately 15 percent. This indicates a certain bargaining power for downstream firms but it may not be sufficient for effective negotiation. In such a case, the threat of regulation of network operators might be necessary. For instance, if negotiation fails, some form of regulation (e.g., access regulation of vertical separation) need to be enforced.

Finally, there is a last condition for effective negotiation, and that is, that negotiation needs to happen under clear conditions and transparency. Renegotiation should also be allowed (i.e., the possibility of only long-term contracts reduces the efficiency of negotiation).

Co-investment

The incremental value of fiber over legacy networks is uncertain. For firms, it is not yet known how consumers will value next generation networks. Furthermore, investment costs remain high in the future. Because of high costs and uncertainty about demand, risk-sharing agreements or co-investment between parties can increase competition and investment incentives compared to the no risk-sharing alternatives (NITSCHE & WIETHAUS, 2011; KOCSIS, 2014; CAMBINI & SILVESTRI, 2013). Co-investment models are found to be the most effective in stimulating investments (NITSCHE & WIETHAUS, 2011; KOCSIS, 2014). As the highest level of investment can be achieved, quality, coverage, and penetration also increase. All these effects increase consumer surplus. Furthermore, by co-investments, duplication of networks can be avoided (KRÄMER &

[17] Insights are borrowed from other network industries, such as energy, railways, and aviation.

SCHNURR, 2014). In co-investment models, the upfront and operating costs of participating firms are reduced. Therefore, these models also increase static efficiency (KRÄMER & SCHNURR, 2014). The effects on competition also depend on how access price encourages the efficient usage of the network (INDERST & PEITZ, 2014; CAMBINI & SILVESTRI, 2012, 2013). First of all on how the access pricing structure influences the risk profile of both firms and second on the timing of seeking access and access payments. A potential negative effect of access prices is that participating firms can use *ex ante* contracts with downstream rivals to hinder competition. Full fiber rollout through the process of competition is unlikely, in particular since there are important economies of scale, with the potential to lead to natural monopolies in certain areas. BIGLAUER *et al.* (2013) analyze the question whether the government should provide subsidies or participate in investment projects (public private partnership, PPP). As the practice shows, (local) governments have incentives in such investments.

Public participation has positive effects compared to fully private initiatives. First, the support by (local) governments reduces risks and can stimulate investments even in a crisis. Second, as practice also shows, local governments are the first adopters of these networks. Therefore, network effects are internalized early and demand for fiber optics network increases. Third, (local) governments, when making investment decisions, take the economy in a broader sense (e.g., adjacent industries) and long-term benefits into account. However, there are some potential disadvantages of PPP models in comparison to private initiatives. First, PPP increases the risk of government failure (BIGLAUER & GUGLER, 2013). However, if the EC controls for state aid, this risk can be reduced. Second, public entities operate less efficiently than private firms. Finally, public participation may substitute private initiatives, crowding out private investments. An example of co-investment models is Reggefiber. Reggefiber, an investment company of FttH networks in the Netherlands, was established in 2005 by a private equity company, Reggeborgh (59%), and KPN (41%). Since then local governments have also invested in it as normal market players. Currently 24 service providers are connected to the FttH network. In October 2014, the ACM approved the acquisition of Reggefiber by KPN. The main reason of KPN for the acquisition was full control over the company. However, this implies that KPN also takes the full investment risk over. As a consequence, the quality of investments may be reduced in the future. [18]

18 "Vodafone stapt naar rechter om overname Reggefiber door KPN", tweakers.net, 13 February 2015; http://bit.ly/1Gdm5kK.

Table 3 - The effects of deregulation on static and dynamic efficiency in comparison to access regulation

Model	*Static efficiency*	*Dynamic efficiency*
General conclusions for deregulation	(-) potential anticompetitive behavior (margin squeeze, collusion in price setting) (+) lower incentives in non-price discrimination	(+) stimulates investments more than access regulation (?) effects on innovation is unknown in most cases
Additional effects		
Free wholesale price setting in case of sufficient infra-based competition		
Voluntary Open Access Model (self-regulation) in case of sufficient infra-based competition	(-) potential for non-commitment	
Negotiated access with a stick (access regulation or vertical separation) if negotiation fails	(+) stick is effective in preventing foreclosure (-) if further consolidation occurs, negotiation may not be effective	
Co-investment with negotiation, fully private	(+) cost reduction (+) first best for CS (-) potential tacit collusion (-) contracts can be used to avoid competition	(+) it is seen as the social optimum for investments (+) increases coverage and penetration if there is demand expansion (+) decreases duplication (-/0) strong incentives for closed cooperatives (+) market players anticipate innovation in OTT-market (demand-side spillovers)
Co-investment with negotiation, public-private-partnership	Idem as above (-/0) government failure (-) potential higher costs than in the fully private model (-) participation of (local) government substitutes private entry	Idem as above (+) (local) government support further decreases risk (+) participation of local government can stimulate demand, also from the side of the government itself (early adoption) (+) (local) governments take into account spillovers to adjacent industries (+) effective against hold-up problem: (local) government anticipates long-term benefits

Source: KRÄMER & SCHNURR (2014) and other studies

■ Reconsidering the role of access regulation

Access regulation remains a complementary measure in case deregulation models fail to lead to an efficient outcome. However, the current form of access regulation raises a couple of issues that we discuss here.

Differential access pricing

First of all, welfare economics argues that differentiated prices are superior to uniform prices in terms of static and dynamic efficiency. By differentiated prices, more degrees of freedom are allowed. First and second generation networks will be operated parallel in the mid-term. Therefore, regulation needs to take into account the difference between prices of copper and fiber, primarily because this price difference can lead to lower incentives to invest in fiber. BOURREAU *et al.* (2014) recommends that access regulation to fiber takes the balance in price setting into account. This balance depends on whether the incumbent or the entrant owns the fiber infrastructure. If the incumbent owns fiber networks, the fiber price should be positively correlated with the copper price. If the entrant dominates fiber investments, higher copper prices can be accompanied with lower fiber prices. A mandatory switch-off of the copper network after full fiber rollout gives flexibility to the regulator in setting access prices.

Symmetric *vs*. asymmetric regulation

Current regulation implies that competing network operators are not regulated symmetrically: the DSL network is subject to access obligations, while cable is not regulated. However, an asymmetric approach may weaken investment incentives (CRANDALL *et al.*, 2002; BIGLAUER & GUGLER, 2013; KOCSIS, 2014). [19] Asymmetric access regulation lowers the investment incentives of the regulated firm. In response, the unregulated firm may also invest less. Regulating both firms would not necessarily lead to the socially optimal investment level either, since the above-mentioned result on

[19] A recent study of ACM analyzes the effects of access regulation on investment incentives. Although the study is comprehensive, it looks at only regulatory models and – due to the nature of the literature – has a focus on monopoly markets (HELLWIG, 2014).

access regulation holds for both firms (static competition is guaranteed but it erodes dynamic incentives more than in the case of deregulation). The literature shows that symmetry provides better investment incentives only if it is combined with some form of deregulation that restores investment incentives, while there is effective competition between the networks.

ACM recently proposed to maintain access regulation of KPN, while ruling out cable access regulations.[20] The European Commission questioned this, suggesting that cable can exert pressure on KPN in the wholesale market.[21] ACM, however, claimed that cable access is not feasible – but the Commission would like to know about this feasibility in the future. Arguably, while acknowledging that the details of obligations matter for precise comparisons between symmetric and asymmetric regulation, investment incentives may be more prone to distortion in an asymmetric regime than in the case of deregulation, in which wholesale competition between KPN and cable would provide incentives to give access as well as invest (a more elaborate analysis is beyond the scope of this paper).

■ Conclusions

Given its dynamic nature, uncertainty is a key characteristic of the telecommunications industry. The revision of the regulatory framework should reflect on the characteristics of the telecommunications industry. Telecom providers are strategically reorienting themselves in response to consolidation and other market and technological developments (e.g. rise of OTT). They operate in a market characterized by three types of uncertainty: (i) market uncertainty: telecom providers search on the basis of trial-and-error the attractiveness of the market and best positioning; (ii) regulatory uncertainty, relating to the implementation and impacts of the regulatory framework and to legal challenges of ACM decisions; and (iii) policy uncertainty, which includes the increasing impact of public interests regarding privacy and security, and the resulting attention of policy makers and politicians for the sector. These uncertainties cause the market to develop in a relatively unpredictable manner.

20 "ACM rules out cable access regulation", Telecompaper April 1 2015.

21 "EC questions Dutch wholesale access market analysis", Telecompaper, May 1, 2015.

What should regulation try to aim at? Instead of infrastructure competition as a goal itself – which is questionable –, the goal underlying government intervention needs to be to maximize social welfare. There is a distinction between static competition (with a focus on low prices for end users) and dynamic competition (with a focus on innovation and investment). It is easier to stimulate static competition (e.g., by access regulation) than dynamic competition – ACM's 'practical' proposal of last year illustrates this. However, the short-term recipe may undermine dynamic efficiency. Regulation focused on dynamic competition (facilities-based competition) is theoretically desirable, but prone to regulatory failures and can thereby create opposite effects, which may harm dynamic efficiency. Furthermore, it is not clear what kind of long-term market structure is the most favorable for the dynamic efficiency (partly because of the great importance of scale effects in the sector and uncertainty). Therefore, it is difficult to enforce a particular market structure or blueprint. Aiming at a certain blueprint for the market further disrupts the natural search process of market players, which distorts the dynamic efficiency. In short, the capriciousness and unpredictability of market developments require room for the dynamics present in the market, so that market players can discover for themselves what they need (demand side) and how they can optimally anticipate this, or respond to market demand (supply side).

Are there alternatives to *ex ante* regulation? If dynamic efficiency is the primary policy objective, then such an access model needs to be chosen that provides sufficient investment incentives. These models are local deregulation (incl. voluntary open access model), investment sharing, and negotiated access. At the same time, these models need to be adjusted by *ex post* supervision in order to avoid potential anticompetitive practices, such as margin squeezing or non-price discrimination. As experience from the UK shows, local deregulation stimulates investments of incumbents and entrants. However, in comparison to other models of deregulation, it is not the most socially desirable for increasing dynamic efficiency. In a competitive broadband internet market, such as the Dutch market, negotiation is a plausible model to increase dynamic efficiency if it is accompanied with regulatory threat when negotiation fails. Private investments may be fostered most effectively by allowing cooperative approaches, such as co-investments (no access payments) or joint ventures. The government can potentially play a role as an investor if there are insufficient private investors.

It may also be required that regulators and competition authorities look at competition in a different way. The choice for a new model is, however, also

not straightforward. An alternative approach in *ex post* supervision (and regulation) can be based on the concept of Schumpeterian competition. This concept suggests that it is crucial for regulation to leave sufficient room for innovation. In this sense the analysis of the value web is a logical corollary to the findings of the empirical literature on the economic effects of regulation in the telecommunications industry.

Focusing on the new dynamics (of the "value web" in networks and services) also raises question about the market structure and the degree of competition needed to achieve the goals of regulation. In the static conception of competition policy a duopoly is a reason for concern and may warrant intervention. In the dynamic conception of regulation a duopoly may be a precondition for creative destruction and innovative practices. In the long run this may improve social welfare to a greater extent than the short-run concern for abuse of market power. Thus, firms and regulators are at crossroads when it comes to, respectively, choosing business models and choosing regulatory models.

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