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**Conference Paper**

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23rd European Regional Conference of the International Telecommunication Society,  
Vienna, Austria, 1-4 July 2012

**Provided in Cooperation with:**

International Telecommunications Society (ITS)

Suggested Citation: Krancke, Jan; Vidal, Miguel; Fier, Andreas (2012) : Changing the rules: Applying a more economic approach to dynamic telecom markets, 23rd European Regional Conference of the International Telecommunication Society, Vienna, Austria, 1-4 July 2012, ITS, Wien

This Version is available at:

<http://hdl.handle.net/10419/66976>

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# Changing the rules: Applying a more economic approach to dynamic telecom markets

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*Traditionally, neoclassical economics has been the guiding framework in the development of legislative and regulatory rules in the telecommunication markets. The regulatory perspective has long assumed a static environment. However, telecommunication markets have evolved into extremely dynamic, innovative and technology-driven markets. At the same time, economic theory has moved well beyond simple, static concepts of neoclassical analysis. Inter alia, Schumpeterian Economics, Institutional Economics and modern Industrial Organization provide a broader framework more suitable to analyze modern telecom markets. Drawing on an extended theoretical baseline and on major industry trends, we propose a more comprehensive framework for telecom regulation – the new regulatory pentagon – based on the cornerstones competition, investment and innovation, convergence and platformization, macroeconomics and growth and, lastly, commitment and credibility.*

**Keywords:** Telecommunications, Regulation, Network investments, Platforms, Innovation, Next generation networks

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This paper reflects the authors' opinions and does not necessarily reflect any opinions held by Deutsche Telekom AG.

## 1 Introduction

Today's regulatory framework for electronic communications is based on the same economic approaches that justified liberalization of the European telecommunications sector twenty years ago. Economic arguments behind telecom regulation are typically based on the theory of natural monopoly. Traditionally, telecommunications was viewed as an industry where capital costs predominate, creating substantial economies of scale and hence high barriers to entry. The liberalization of the telecommunication market, end of the 1990s, has entailed sector specific ex ante regulation, focused on static efficiency and to the problem of natural monopoly.

However, since the 1990s the telecommunication markets have changed considerably. The take-up of broadband has transformed the telecommunications landscape in most countries. With plans to deploy fibre to keep pace with increasing end-user bandwidth requirements, the telecommunications sector faces a major investment wave. However, in Europe investments in next generations networks (NGN) are comparatively modest. Main reasons are the current regulatory framework perceived as discouraging infrastructure investment, investors' doubts about the financial viability of NGN investments and a difficult macroeconomic environment. Furthermore, converging ICT markets and the trend towards 'platformization' imply that OTT players are increasingly cannibalizing telcos' traditional core markets with unregulated substitute products, raising concerns about a level playing field between regulated telecom incumbents and unregulated OTT players.

In consequence, many scholars have argued that the current regulatory framework is not adequate for new market realities (e.g. Alleman & Rappoport, 2005; Bauer, 2010; Fransman, 2010; Noam, 2010; Briglauer & Vogelsang, 2011). A regulatory framework aimed at achieving static efficiency is viewed as inadequate in a market environment where a significant portion of new infrastructure needs to be built and the former monopoly environment has evolved towards an ecosystem of regulated and unregulated players.

For years, European regulators have acknowledged the necessity of providing incentives for investments in new high-speed networks (e.g. EC Directive, 2009/140). However, de jure and de facto regulation of European telecom markets has by and large remained geared towards static efficiency. For example, the 2010 NGA Recommendation prescribes the imposition of cost orientation on next generation access (NGA) products in most circumstances (European Commission, 2010a). The skeptical attitude towards the European regulatory regime expressed by many academic scholars has been echoed by representatives of the investor community, who emphasize that European telecom regulation crushing revenues and returns out of the industry does not encourage network infrastructure investments (Bienenstock et al., 2012; Funnell & Wright, 2012; Howard, 2012). As a response, the European Commission announced a paradigm shift in regulatory policy (European Commission, 2012) aiming at ensuring regulatory predictability over time and increased pricing flexibility for NGA networks. The European Commission will propose (non-binding) recommendations covering cost methodologies for regulated network

access wholesale prices and on non-discrimination, which are supposed to be in place by 2020.

The challenges which the European telecom industry is facing, perceived shortcomings of the current European regulatory framework and policy makers' regulatory reform plans call for a more fundamental analysis. In the following section, we review the current market environment facing the European telecom industry, focusing on major investment requirements, investor skepticism about the industry's financial prospects, and the emergence of new competitors in converging ICT markets. In section 3, we review the economic foundations of the current regulatory paradigm in telecoms, addressing the limitations of neoclassical analysis and identifying alternative approaches more suitable for the analysis of today's telecom markets. In section 4, we propose a 'new regulatory pentagon' as a more comprehensive framework to improve the design of regulatory policies. The pentagon is based on five cornerstones: competition, investment and innovation, convergence and platformization, macroeconomics and growth, and, lastly, credibility and commitment.

## **2 Competition, market dynamics and regulation: challenges in European telecommunication markets**

Since the 1990s, the telecommunications sector has developed into a highly dynamic innovation and technology driven market. To appreciate the dynamics of the sector, Noam (2010) suggests thinking of three generations of telecommunications: The first, based on copper networks, was monopolistic in market structure with government ownership or control. The partial liberalization of the telecommunications sector in the USA in the 1980s marked the beginning of the second generation, stressing privatization, liberalization, market entry and competition. In Europe, telecom markets were fully liberalized in 1998. Sector-specific regulation was introduced to break the incumbents' monopolies and to open up the telecom markets to new competitors. Market shares of incumbent operators have followed a downward trend, with new entrants' market shares above the 50% mark in most European countries. In the European DSL market, local loop unbundling has become the main form of wholesale access for new entrants (European Commission, 2010b).

With the emergence of fiber-optics and high capacity wireless networks, technology has taken another major step forward, heralding the *third generation* of telecommunications (Noam, 2010). As a significant portion of new infrastructure needs to be built, either by upgrading existing networks or by rolling out new networks, the telecommunications industry faces a major investment wave. The costs of upgrading the European fibre infrastructure to levels equaling leading Asian countries are estimated at Euro 300 billion (Begonha et al., 2010) – a major financing challenge for the telecom industry.

However, more than a decade after market liberalization, there are serious doubts about whether the European telecom industry is in a position to engage in major fibre invest-

ments. Just one third of major European telecom operators make a return on investment which exceeds their cost of capital; over the period 2009 to 2012, returns are estimated to have dropped by 9% per year (Bienenstock et al., 2012). A long period of disappointing returns has left investors skeptical about the European telecommunications sector and the prospects for NGA investments (Howard, 2012). In a survey of 65 major institutional investors, 91% of respondents indicated that European telecom regulation does not encourage network infrastructure investment in general due to a lack of predictability in regulatory decisions, a regime that is too favorable to resellers and a deflationary bias of regulatory decisions (Funnell & Wright, 2012).

Empirical analysis confirms that in Europe, sector-specific regulation has continually increased over time. Based on an evaluation of 41 regulatory indicators, Zenhäusern et al. (2012) show that in the EU-27, regulatory density increased in the period from 1997 to 2010. In contrast, in the United States the regulatory density index decreased in the respective time period. Econometric research suggests that regulation has an adverse effect on infrastructure investment (Friederiszick et al., 2008; Briglauer et al., 2012) and innovation (Bauer & Shin 2012).

The European telecom industry's ability to finance major infrastructure ventures is further undermined by the European debt crisis. For most telcos, refinancing on the capital markets has become more difficult. The need to reduce net debt is increasing, since debt-equity ratio is a key criterion for rating agencies when assessing corporate creditworthiness. This applies in particular to operators based in those European countries mostly affected by the European debt crisis, which are also experiencing a drop in demand in their home markets (Barber, 2012).

In third generation telecommunications, markets are increasingly developing towards an ecosystem of multiple regulated and unregulated players (Fransman, 2010). Technological advance, in particular the migration towards an 'all IP' world, has initiated new forms of competition to traditional telcos, the "over-the-top" (OTT) competition. Originally, the OTT acronym referred to on-line delivery of video and audio without the Internet service provider being involved in the control or distribution of the content itself. The concept also applies to communication services, denoting OTT services offering instant messaging, voice and video communication over the Internet. The diffusion of the latter have eroded established operators' voice and especially messaging revenues. The shift of text messaging from mobile carriers to Internet providers signifies a fundamental change in business models: conventional text messages (SMS) are transported over a signaling channel in mobile networks and billed by mobile communications providers. Internet providers send short messages in data packets, for which users who subscribe to popular data flat rate plans pay no extra charge. Market research has shown that telecom operators lost almost \$14bn in revenues in 2011 due to a decline in text messaging owing to the rise in the use of social messaging services provided free over the Internet on smartphones (Economist, 2012b).

Thus, regulated telcos are increasingly facing competition from non-regulated OTT players. Major OTT players such as Apple, Google, Facebook and Amazon are expanding their web-based platforms, benefitting from positive network effects in two-sided markets. Other OTT players' activities directed towards telecom markets include Google's acquisition of Motorola, giving Google control of numerous wireless patents (Taylor & Waters 2011), Facebook's plans to create its own handset (Garside, 2012) or Google's fibre city project in Kansas City (Har-Even, 2012). Google is also investing in satellite operator O3b Networks, which plans to deliver satellite Internet and mobile backhaul services to emerging markets.

To summarize, European third generation telecom markets are facing four major challenges: substantial investment requirements, investor skepticism about the sector's financial prospects, a poor macroeconomic environment and the emergence of new competition in converging markets. Thus, the question rises whether sector-specific regulation, more specifically the current European regulatory framework – designed to facilitate the transition from monopoly to competition – is still adequate. Many scholars argue that it is not (e.g. Alleman & Rappoport, 2005; Bauer, 2010; Fransman, 2010; Noam, 2010; Briglauer & Vogelsang, 2011), mainly because of the lack of sufficient incentives for infrastructure investment and because of the changing industry landscape due to market convergence and 'platformization'.

In the next section we will summarize the economic foundations of today's regulatory framework, identify shortcomings in the light of current market developments and discuss alternative approaches.

### **3 Economic foundations of telecoms regulation: overcoming the limitations of neoclassical analysis**

The rationale for regulating the telecommunications industry is provided by the theory of natural monopoly. A market is a natural monopoly if, at the socially optimal quantity, industry cost is minimized by having only one firm produce. Traditional analysis of natural monopoly focuses on the question of how society can benefit from least-cost production, which requires single-firm production, without suffering from monopoly pricing (Viscusi et al., 2005). Theoretically, through regulation, access to essential facilities must be granted at an efficient price.

Consequently, telecom regulation rests mainly on two pillars: access and price regulation. In order to facilitate market entry, regulators oblige the incumbent to interconnect with the networks of the new entrants, thereby substantially lowering barriers to entry. Regulators turned to neoclassical price theory to determine the 'optimal' price that a new entrant should pay an incumbent for access to its networks. Ideally, according to the theory of perfect competition, first-best pricing is price equals marginal costs. Different cost models were developed to mimic the marginal cost methodology (Vogelsang, 2003).

The model of perfect competition in neoclassical theory serves as a reference for the theory of natural monopoly and for telecom regulation in practice (Alleman & Rappoport, 2005). Clearly, the conventional model of perfect competition produces many desirable results. Only efficient producers survive, and they produce at lowest minimum costs. In equilibrium, prices are optimal; consumer welfare is maximized.

However, there are several fundamental problems using the model of perfect competition as a reference for telecom regulation (Fransman, 2010). First, it is widely acknowledged that perfect competition is rare and may not even exist (Bishop, 2004). The model of perfect competition is based on five important assumptions: products are homogeneous, information is perfect, the number of buyers and sellers is large enough to ensure that nobody has market power, there are no barriers to entry or exit, public goods and externalities do not exist. If one or more conditions do not hold, the situation immediately becomes an instance of market imperfections (Groenewegen et al., 2010).

As the model of perfect competition is far removed from market place realities, the question arises whether it should serve as a guiding model for telecom regulation. Scholars such as Alleman et al. (2009) argue that a mis-reading of the meaning of competition and the use of inappropriate models will ultimately result in regulation leading to a decrease in economic welfare. This would counteract the original purpose of regulation, namely to raise social welfare relative to what it would have been in the absence of regulation.

Furthermore, the model of perfect competition is fundamentally static, i.e. it does not take into account technology shifts, innovation, or shifts in consumer preferences. In particular, in neoclassical economics technology is an exogenous variable. Technology determines the relationship between labor and capital on the one hand and output on the other (the production function). In neoclassical economics “firms are just production functions in a sea of market transactions” (Groenewegen et al., 2010, p. 367). As technology is exogenously given, neoclassical analysis does not explicitly address technical progress and its effects on industry structure. However, in reality innovations are constantly being spawned that alter the production technology or introduce unregulated substitute products.

As previously discussed, today’s telecommunications markets are anything but static. The dynamic aspects of competition were famously emphasized by Schumpeter: Schumpeter’s dynamic theory of competition focuses on the “creative destruction” of old incumbents by new entrants, who are rewarded with dominant market positions until being replaced by the next round of insurgents (Schumpeter, 1942). A temporary lead allows firms to appropriate risk premiums as a compensation for their willingness to assume innovation risks. Under this theory, the most significant competition takes place not within a market (in the form of price or quality differentiation), but for the market itself: i.e., in establishing the next great invention that will displace the old monopoly with a new one (Nuechterlein & Weiser, 2005). Consequently, Schumpeter was very critical of regulatory policies designed to mimic the outcomes of perfectly competitive markets, but his critique was widely disregarded (Bauer, 1997). As Richard Posner remarked, “The

gale of creative destruction that Schumpeter described, in which a sequence of temporary monopolies operates to maximize innovation that confers social benefits far in excess of the social costs of the short-lived monopoly prices that the process also gives rise to, may be the reality of the new economy.” (Posner, 2001, p. 931).

The challenges which European third generation telecommunication markets face underline the need to develop economic approaches and models which go beyond traditional neoclassical analysis. Schumpeterian economics emphasize market dynamics and innovation. Institutional Economics have addressed regulators’ fundamental dilemma in credibly developing policies serving the long-term interests of consumers while resisting short-term pressures to renege on long-term promises (Williamson, 1975; Armstrong & Sappington, 2006). In response to public pressure, regulators may reduce prices as close as possible to marginal costs. Over time, firms will realize they are unlikely to recover any sunk costs they incur: investments in new network infrastructure will not take place. Regulatory risks loom as short-term and long-term interests may be in conflict with each other; the regulator may prove to be an “unreliable player” (Groenewegen et al., 2010, p. 362). Regulation-induced uncertainty negatively impacts not only investment decisions made by incumbents and their competitors, but also on investment-related evaluations made by financial institutions and markets (Fransman, 2010). The perceived lack of predictability is also bound to stoke fears of regulatory hold-ups (Groenewegen et al., 2010): Once irreversible infrastructure investments are made, the investing company might unexpectedly face disadvantageous regulatory measures, reducing earning prospects and thus the value of the investment.

Scholars such as Friederiszick et al. (2011) also refer to Institutional Economics in order to analyze investment incentive schemes in today’s Internet governance regime. Friederiszick et al. argue that because of its fundamental design features, the Internet can be viewed as a common-pool resource, making the occurrence of problems typical for common-pool resources likely (mainly congestions and overuse). Common pool resources are goods for which rivalry exists among users, but whose characteristics make it difficult to exclude beneficiaries from its use. This implies free riding problems and consequently suboptimal investment in the resource. Hardin (1968) was pessimistic about the chances of survival of common property systems, but later authors (notably Ostrom, 1990) argued that solutions to prevent the ‘tragedy of the commons’ are possible. The analysis of common-pool resource related problems illustrates that a sustainable Internet business model requires ensuring adequate investment incentives and effective resource management.

The economics of network markets have been widely addressed by the industrial organization literature (e.g. Belleflamme & Peitz, 2010; Shapiro & Varian, 1999). Network effects may cause market failures (e.g. users may coordinate on inferior standards or firms may fail to make their products compatible when it would be welfare-improving to do so). Therefore, the question rises as to whether regulatory interventions are able to correct (or at least alleviate) those market failures. David (1987) shows that both ex ante as well as ex post interventions are fraught with major difficulties. Furthermore, the



benchmark of perfect competition is inadequate as network markets usually imply market share inequality and a high profitability of the top firm not necessarily resulting from anticompetitive behavior.

The theory of two-sided markets (Rochet & Tirole, 2003) has addressed the economics of digital platforms. Digital platforms, playing a central role in the era of third generation telecommunications (Ballon, 2009; Gawer, 2009; Veugelers, 2012), are two-sided. Platform providers must attract both consumers and developers of complementary applications in order to succeed. Positive externalities between user groups imply that the platforms attractiveness for one user group increases as the other user group grows. These positive network effects impact profit-maximizing pricing behavior in two-sided markets, which differs from profit-maximizing pricing in ‘normal’ markets. Digital platforms present new challenges for regulatory and competition authorities, as applying conventional ‘one-sided’ logic to two-sided markets may lead to erroneous decisions. To be effective, regulation and antitrust assessment must be based on an accurate understanding how two-sided markets operate (Belleflamme & Peitz, 2010).

To summarize, economic science has moved well beyond neoclassical analysis. Inter alia, modern Industrial Economics, Institutional Economics and Schumpeterian Economics offer a rich framework more suitable for the analysis of modern telecom markets. Considering the transformation of the telecom industry and the potential harm resulting from using inappropriate models and mis-reading the meaning of competition, broadening the economic base of regulatory policy seems advisable.

## **4 The new regulatory pentagon for telecom regulation**

In the previous sections we have identified the shortcomings of today’s dominant regulatory paradigm based on the neoclassical analysis in light of recent developments in the telecommunications markets. In section 4.1, we suggest the new regulatory pentagon as a more comprehensive analytical framework and discuss the cornerstones on which the pentagon is based. In section 4.2 we apply the pentagon framework illustrating in a stylized manner a balanced regulatory equilibrium, comparing it to the status quo.

### **4.1 The regulatory pentagon’s cornerstones**

The new regulatory pentagon is based on five dimensions which we consider essential to regulating modern telecommunication markets: competition, dynamic efficiency promoting investment and innovation, convergence and platformization, macroeconomics and growth and, lastly, commitment and credibility. The main purpose of the pentagon is to illustrate the key dimensions regulatory policy needs to take into account when designing regulatory measures. In particular, measures that lead to benefits in one particular area might entail costs in other areas. A holistic assessment of regulatory measures based on all five dimensions of the pentagon might help to avoid ‘regulatory myopia’ and improve short- and long-term economic welfare.

The trade-off between *static and dynamic efficiency*, the pentagon's first two cornerstones, have been widely addressed in the literature (e.g. Alleman & Rappoport, 2005; Gayle & Weisman, 2007; Bauer & Bohlin, 2008; Cambini & Jiang, 2009; Bauer 2010). Fast growing Internet traffic, substantial investment requirements to upgrade broadband infrastructure and sluggish ultra-broadband roll-out in Europe point toward the need to put more emphasis on dynamic efficiency in the European regulatory framework. Empirical analysis confirms that strict cost-based access regulation has a negative impact on broadband infrastructure investment (Friederiszick et al., 2008; Briglauer et al., 2012). Bauer & Shin (2012) show that regulation has also a negative impact on innovation in the ICT sector.

*Convergence and platformization* is the pentagon's third cornerstone. Innovations, including new unregulated substitute products, demand-shifts over time and changing production technology fundamentally transform the (former) natural monopoly. Supply and demand conditions may change to the point that the industry is no longer a natural monopoly (Viscusi et al., 2005). Furthermore, today's ICT markets are characterized by far-reaching 'platformization' (Ballon, 2009; Gawer, 2009). In such markets, platform leaders have built their business models around crucial gatekeeper functionalities, aiming at controlling the wider value chain and capturing significant value (Boston Consulting Group, 2011). The emergence and pervasiveness of platforms call for a reappraisal of regulatory policies. Ballon & Van Heesvelde (2011) identify two key regulatory concerns. First, it can be argued that platforms should be at the centre of regulators' attention. Because of inherent network effects, platforms show a strong tendency towards concentration and the emergence of *de facto* standards (Shapiro & Varian, 1999). High switching costs may lead to lock-in effects, favoring market concentration and creating high entry barriers. Clearly, in a platform environment access operators are no longer the only type of player potentially exploiting bottlenecks or controlling the market. Second, regulators who impose access and price regulations on one specific type of actor rarely take into account the impact of such regulation on the entire Internet value chain. Thus, policy makers and regulators should use a more holistic framework, shifting the emphasis from isolated relevant markets towards an integrated view of the digital value chain, taking into account leading platform owners' specific business models.

The pentagon's fourth cornerstone, *macroeconomics and growth*, has two facets. First, as discussed in section 2, the European debt crisis has impaired financing of large-scale infrastructure investments. Furthermore, Europe is not only facing a debt crisis, but also a growth crisis (e.g. Economist, 2012a). The greater challenge of ensuring macroeconomic growth calls for further research in analyzing the impact of regulatory measures in telecommunications on sectoral and macroeconomic growth. It is counterproductive to maintain growth inhibiting sector specific regulatory measures that do not affect fundamental protections, when, simultaneously, European policy makers need to boost economic growth in order to return to sustainable public finances.

The second facet of the pentagon's macroeconomics cornerstone relates to ICT as a general purpose technology. According to Bresnahan & Trajtenberg (1995), general purpose

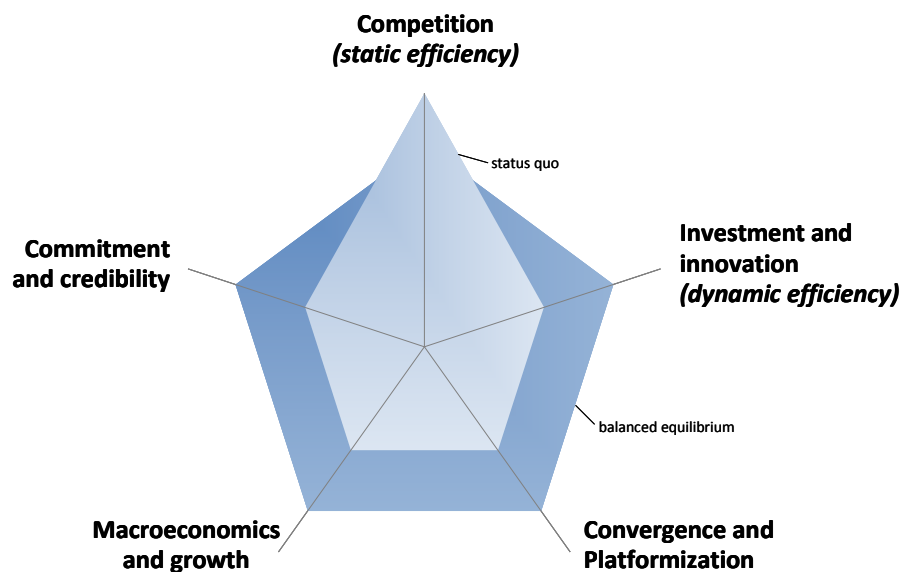
technologies are enabling technologies that provide a platform for subsequent applications (rather than being in themselves complete solutions). The total economic impact of a general purpose technology at any given point in time is much greater than the direct impact of its individual components (Grajek, 2012). The OECD has identified eight main economic impact areas of the Internet on individuals, governments and firms: consumer welfare, employment, business environment, firm performance, environment, education and research, healthcare and government activities (Stryszowski, 2012). A large body of research suggests that investments in telecommunications and broadband infrastructure promote, inter alia, macroeconomic growth (Röller & Waverman, 2001; Koutroumpis, 2009; Czernich et al., 2011), productivity growth (Brynjolfsson & Saunders, 2010; European Commission, 2010b; Kretschmer, 2012) and employment (Katz et al., 2010; Péliissié du Rausas et al., 2011); for a comprehensive review see Wieck & Vidal (2011). Network infrastructure investments are closely linked to innovations and growth on the contents and applications layer, including cloud computing, machine-to-machine applications (smart grids, connected cars, e-health) and social networks. Practitioners' analysis predicts the 'Internet economy' to further substantially transform the economy and generate growth (Péliissié du Rausas et al., 2011; Dean et al., 2012). Consequently, investment in high-speed broadband infrastructure is an important lever for stimulating growth, both in the short run, through private investment, and in the longer run, by maintaining the viability of new data-intensive services.

*Credibility and commitment* is the pentagon's fifth cornerstone. As previously discussed, Institutional Economics have analyzed regulators' fundamental dilemma credibly committing to policies serving consumers' long-term interests. Regulators' potential inclination to favor short-term over long-term interests creates regulatory risks and uncertainty, which negatively impacts investment decisions and sector evaluations made by financial institutions and markets. As previously discussed, investors are fundamentally skeptical about European telecom regulation and its impact on the market environment. Therefore, restoring investor confidence is a primary task. In order to restore confidence and mitigate regulatory risks and uncertainty, regulators need to credibly commit to long-term policies fostering dynamic efficiencies. As mentioned, the European Commission has addressed these concerns in a recent policy statement (European Commission 2012). It remains to be seen whether more specific policy measures will achieve the goal to provide more regulatory stability and consistency to the European telecom sector.

## **4.2 Tentative applications of the regulatory pentagon**

Fig. 1 shows to regulatory pentagons in a radar chart. The regular pentagon depicts in a stylized manner a balanced regulatory framework which puts equal emphasis on the five key dimensions of telecom regulation. As many practitioners and academic scholars suggest, the actual regulatory framework in Europe leans too much towards static efficiency, neglecting dynamic efficiency considerations, the sector's rapid evolution towards an ecosystem of regulated and unregulated players, the sector's macroeconomic relevance

and commitment and predictability. The irregular pentagon in Fig. 1 depicts in a stylized manner the status quo of regulatory policy in Europe.



**Fig. 1.** The new regulatory pentagon: balanced equilibrium vs. status quo.

The European Commission’s announcement in 2012 to overhaul European regulatory policy explicitly addresses the need to promote investment in high-speed infrastructure, new digital infrastructure, applications and services providing major benefits to the economy, and the need to provide regulatory stability and consistency over time (European Commission 2012). At the same time, the European Commission cautiously deemphasized static efficiency, indicating her intention to refrain from lowering copper prices and to waive cost-oriented NGA access if stricter non-discrimination obligations are met and if a ‘significant competitive constraint’ applies. If the European Commission’s policy change announcements are properly implemented, in Fig. 1 the pentagon depicting actual regulatory status will converge towards the balanced equilibrium state.

The need for a consistent and balanced regulatory framework is underpinned by counter-productive policy measures which can be observed in practice. A case in point are “crisis taxes” imposed on telecom operators which serve the purpose of alleviating short-term pressure on government budgets, but counteract the EU’s and member states’ efforts to stimulate telecom infrastructure investment (Grajek, 2012). In an empirical analysis of the Greek mobile telecommunications market, Koutroumpis et al. (2011) analyze the impact of a special levy on mobile services and show that the special levy had severe adverse effects on employment and the contribution of the telecommunications sector to GDP. The authors conclude that “the adoption of high sector specific service taxes with the objective of increasing government revenues creates an economic distortion that lowers service usage, shrinks sector revenues, and ultimately jeopardizes the competitiveness

of the Greek mobile telecommunications sector” (Koutroumpis et al., 2011, p. 686). As other European countries such as Hungary and Croatia have also imposed controversial sectoral taxes in telecommunications (Eddy, 2012), further research is needed in order to understand and quantify adverse effects at sectoral and macroeconomic level. Furthermore, ad hoc special levies imposed on the telecom sector illustrate the relevance of regulators’ and policy makers’ commitment and credibility.

## **5 Conclusions**

In the 2000s, the European Commission gradually adopted a ‘more economic approach’ in the field of competition law. Formalistic legal rules have been amended by new rules focusing on the economic effects of cartel agreements and mergers. An economics-based approach requires a careful examination of how competition works in each particular market in order to evaluate how specific company strategies affect consumer welfare (Gual et al., 2006). In this paper, we argue that a ‘more economic approach’ is also needed in the field of telecom regulation. Dynamic competition in technology- and innovation-driven markets requires a departure from a regulatory framework based on neo-classical analysis and focused on static efficiency, designed at the time to open up a monopolistic market and establish competition. Economic theory has moved well beyond simple, static concepts of neoclassical analysis. Inter alia, modern Industrial Economics, Institutional Economics and Schumpeterian Economics offer a rich analytical framework for the analysis of modern telecom markets.

Drawing on an extended theoretical baseline and on major industry trends we propose a comprehensive analytical framework for telecom regulation, the new regulatory pentagon, based on five cornerstones: static efficiency, dynamic efficiency, convergence, macroeconomics and commitment. Facing the trade-off between static and dynamic efficiency, more weight should be accorded to promoting dynamic efficiency. With the emergence of fibre optics and high capacity networks, technology has taken a major step forward and the industry faces a major investment wave. Fast growing Internet traffic, new applications requiring high transmission standards and the increasing importance of data-driven applications place major demands on the telecommunication infrastructure. Therefore, network access regulation should not take place at the expense of innovation and investment. Regulation will have to take carefully into consideration its implications for investment and innovation decisions that shape the future development of the sector.

With converging Internet and telecommunication markets, boundaries and contours of the relevant markets are blurring. New providers are penetrating telcos’ core business with innovative substitute products and services. The emergence and pervasiveness of platforms call for a reappraisal of regulatory policies: state of the art regulation must envisage the entire digital value chain, ensuring a level playing field among regulated and unregulated competitors.

Macroeconomics are increasingly relevant for telecom regulation. Empirical research suggests that investment in telecom infrastructure has an impact far beyond the scope of the industry. In the current European macroeconomic environment, regulatory measures which inhibit growth and do not affect fundamental protections should be critically reviewed and possibly discontinued.

Finally, and perhaps most importantly, regulators' commitment and credibility play a crucial role in establishing a reliable and predictable framework, a key prerequisite for discarding regulatory risks and encouraging long-term investments. Investor confidence in European telecoms has suffered following years of disappointing returns and major doubts about the financial prospects of infrastructure investments. The European Commission's announcement that it will give longer-term regulatory guidance until 2020 is an encouraging step forward in addressing the problem of regulatory risks and uncertainty.

The choice of regulating an industry means that regulators are ultimately responsible for the health of the industry. Regulating a natural monopoly can be welfare-improving, but regulating an industry that is no longer a natural monopoly may be welfare-reducing. Applying a more comprehensive analytical framework such as the new regulatory pentagon might help to avoid 'regulatory myopia' and increase economic welfare.

## Acknowledgements

The authors would like to thank Marie Dowling and participants at the 23<sup>rd</sup> European Regional Conference of the International Telecommunications Society in Vienna (July 1-4, 2012) for helpful comments and suggestions on a previous version of this paper.

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